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Economics of Producer Gas, Fuel Oil and Natural Gas Compared

(IN FIVE PARTS)

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Part II.
Analysis of Producer Gas as Tank Fuel

THE general aspects of the problem were discussed in Part 1[1] together with the basic method of solution. In the development of this subject a glass tank using producer gas from coal is assumed as a starting point, although the start could be made just as well if fuel oil or natural gas were the normal fuel. The quantity of fuel required per unit time must be known for the individual tank in order to make accurate comparisons. If several tanks are involved they must each be considered separately unless the operating conditions are similar.

Data necessary for the calculations are: ultimate analysis of coal, average producer gas analysis, average temperature of air and gas preheat at top of checkers, tank temperature. Carbon in the gas and tar mists may be neglected if the gas mains are properly designed and are long. If the mains are short consideration must be given tar mists and free carbon. In the following the average tar mist plus carbon is taken into consideration. Evaluation of coal is made on the "as received" basis of the fuel, as that is the purchase basis of the fuel. Calculations are made on a 60 degrees Farenheit base.

The data below is typical and is taken for the example.

Analysis of coal		Modified Orsat Analysis of producer gas Moisture % by volume	
Moisture	3% by weight	CO_2	5 %
Total Carbon	80% by weight	CO	26 %
Hydrogen	6% by weight	H_2	12 %
Oxygen	5% by weight	CH_4	3.5%
Sulphur	1% by weight	H_2	53.5%
Ash	6% by weight		
Nitrogen	2% by weight		

B.T.U. coal—14,300 per lb. as received. Total 100 %.

Combustible in ash—10% in weight.

Excess air with produce gas = 50%.

Pounds of coal per 24 hours. = 60,000 or 30 tons.

Steam per pound of coal = .4.

Temperature of gas and air preheat at top of checkers, 20 minute reversals 2300 F. average.

Temperature in tank, assumed or gas temperature as waste gas enters ports 2600 F.

Carbon and tar leaving producer .00022 lbs. per cu. ft. producer gas.

The first step is to calculate the number of cubic feet of producer gas per pound of coal. This is done by dividing the carbon content of 1 cubic foot of gas into the carbon content of 1 pound of coal. The weight of carbon per cubic foot of carbon bearing constituent is .0317 pounds.

Carbon in 1 cu. ft. gas

CO_2	.05 × 1 × .0317
C_2H_4	0 × 2 × .0317
CO	.26 × 1 × .0317
CH_4	.035 × 1 × .0317
Total	= .345 × .0317 = .10936
Add free carbon and tar	= .00022
Total in 1 cu. ft. gas	.0196

Ash in coal = 6%.

Carbon in 1 lb. ash = 10%.

$$\text{Carbon in ash from 1 lb. coal} = \frac{.10 \times .06}{1.00 - .10} = .0065.$$

Carbon in 1 lb. coal = .80.

Carbon in ash from 1 lb. coal = .0065 lb.

Hence net carbon to gas = .7935 lb. from 1 lb. coal.

$$\text{Gas per pound of coal} = \frac{.7935}{.1096} = 72.5 \text{ cu. ft.}$$

Calorific or chemical heat content of cold gas—low or net values:

Constituent	Percent	B.T.U. cu. ft. Constituent	B.T.U. per cu. ft. gas
C_2H_4	.0	1505	0
CO	.26	322	84
CH_4	.035	909	31.7
H_2	.12	274	32.8

Total B.T.U. 1 cu. ft. cold gas—148.5

A part of the soot and tar is deposited in mains. A test indicated that in one installation .00007 lbs. of carbon as

[1] THE GLASS INDUSTRY, Vol. 10, No. 2 (Dec., 1929) p. 283.

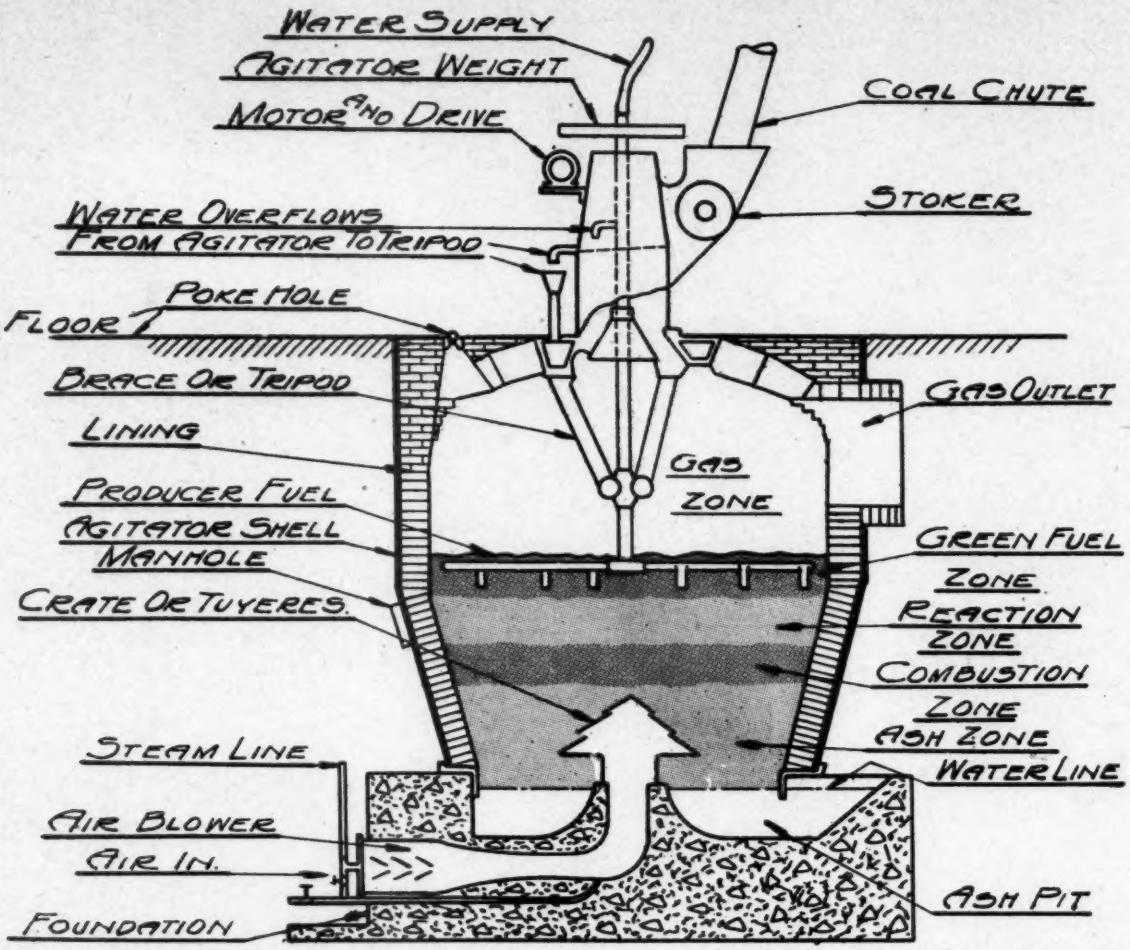


FIG. 2. SECTION OF A SEMI-MECHANICAL WATER VAPOR GAS PRODUCER SHOWING PRODUCER ZONES.

free carbon and in tar mists were swept into combustion chamber with 1 cu. ft. of gas. Using this value and the heat value of 1 pound of free carbon as 14600 B.T.U. when oxidized to CO_2, 1.00 B.T.U. is released from free carbon accompanying 1 cu. ft. of gas. The total chemical heat content of 1 cu. ft. gas equals 148.5 plus 1.00 or 149.5 B.T.U. and from one pound of coal 72.5 $\times$ 149.5 or 10820 B.T.U. are carried to tank and are liberated during the process of combustion.

The quantity of steam entering the producer is of interest because excess steam is an inert that must be superheated in the tank and it carries useful heat from the combustion chamber. Steam blown to a gas producer varies from .3 to .5 pounds per pound of coal. A fair average is .4 pounds per pound of coal. This data may be checked by flow meters or by using a flow formula when the steam pressure and orifice diameters are known in the case of steam jet air blowers.

The amount of water vapor accompanying the producer gas is equal to the water vapor (steam and moisture in the fuel) entering the producer minus the quantity of water vapor decomposed in the producer. The first step is to determine how much steam is decomposed.

H_2 in C_2H_4 = O $\times$ 2 $\times$ .00529 when .00529 equals weight of 1 cu. ft. of H_2.

H_2 in CH_4 = .035 $\times$ 2 $\times$ .00529.

H_2 in H_2 = .12 $\times$ 1 $\times$ .00529.

Total H_2 = .19 $\times$ .00529 = .00101 lbs. from 1 cu. ft. of gas or .073 lbs. per pound of coal.

H_2 in coal (per pound as received) = .06 pounds.

H_2 from steam (per pound coal) = .04 pounds.

Total H_2 in gas per pound coal = .10 pounds per pound coal.

Subtracting, 0.10 minus 0.073 gives .027 lbs. H_2 in excess per pound of coal or the equivalent .027 $\times$ 9 or .244 lbs water vapor. (The combination ratio of H_2O to H_2 is 9 to 1 by weight).

The volume of water vapor accompanying one cubic foot of gas $= \frac{.244 \times 21.00}{72.5}$ = .070 cubic feet. The actual volume of 1 cu. ft. of gas with moisture condensed is 1.070 cubic feet with moisture not condensed.

The next step is to calculate the sensible heat in the producer gas as it enters the combustion chamber carrying 2300 F. preheat temperature. The gas preheat temperature assumed herein probably is 300 F. higher than is usually encountered. High gas preheat of course favors producer gas over other fuels and care must be taken in measuring this temperature in the selection of data.

Gas	Vol. of gas in 1 cu. ft. producer gas	[1]Heat in one cu. ft. each gas at 2300 F. above 60	Heat in actual gas above 60 F.
CO_2	.05	79	3.95
C_2H_4	.0	152	.0
CH_4	.035	195	6.82
CO	.26	46	11.95
O_2	.0	46	.0
H_2	.12	46	5.50
N_2	.535	46	24.60
H_2O	.070	63	4.41

Total 57.23 B.T.U. per cu. ft. of gas.

[1] Formulae and method of calculation for any temperature will be given in Appendix I Part V in a later issue.

Heat carried in with gas per pound of coal $= 72.5 \times 57.23 = 4160$ B.T.U.

The air required for combustion together with excess air enters the checkerwork and is preheated to 2300 F. average. This preheat temperature assumed is higher than is usually found except for 20 minute reversal periods and ample checker capacity.

Air required for combustion and products of combustion.

Producer gas: Constituent	Producer gas: Constituent cu. ft. per cu. ft. gas	Theoretical: O_2 required Volume	Theoretical: CO_2 formed Volume	Theoretical: H_2O formed Volume
CO_2	.05	.0	.05	.0
C_2H_4	.0	.0	.0	.0
CH_4	.035	.07	.035	.07
CO	.26	.13	.26	.0
O_2	.0	.0	.0	.0
H_2	.12	.06	.0	.12
N_2	.535	.0	.0	.0
H_2O	.070	.0	.0	.070
Totals	1.070	.26	.345	.260

Volume air required $= \frac{.26}{.208} = 1.25$ cu. ft. per cu. ft. gas

where .208 percent of air is O_2. With 50 percent excess air 1.25×1.5 or 1.87 cu. ft. of air enters tank per cubic foot of producer gas.

The excess oxygen amounts to $.26 \times 1.5$ minus .26 or .13 cu. ft. per cu. ft. producer gas with 50% excess air. The total nitrogen coming in with the air is $.792 \times 1.87$ or 1.48 cu. ft. per cu. ft. producer gas where 79.2 percent of air by volume is nitrogen. The water content of air is omitted as it has little bearing on the final results.

Summarizing air and waste gas volumes—per cubic foot of producer gas with 50% excess air.

Air entering at 2300 F. = 1.87 cu. ft.

Oxygen leaving at 2600 F. = .13 cu. ft.

Nitrogen from producer gas leaving at 2600 F. = .535 cu. ft.

Nitrogen from air leaving at 2600 F. = 1.48 cu. ft.

Total N_2 leaving at 2600 F. = 2.02 cu. ft.

CO_2 leaving at 2600 F. = .345 cu. ft.

H_2O leaving at 2600 F. = .260 cu. ft.

The waste gas analysis as expected by Orsat neglecting products from raw materials being melted is given below.

Item	Volume waste gas constituents per cu. ft. gas	Percent dry waste gas by volume
CO_2	.345	13.8
O_2	.13	5.2
N_2	2.02	81.0
Total	2.495	
H_2O	.260	

One cubic foot of air at 2300 F. has a heat content of 46.2 B.T.U. above 60 F. In 1.87 cu. ft. of air 87 B.T.U. are present. Therefore for 1 pound of coal 87×72.5 or 6300 B.T.U. from the regenerators enter the combustion chamber as sensible heat in the air supplied.

The heat carried out by the 2600 F. waste gases from 1 cubic foot of producer gas with complete combustion and 50% excess air is:

Constituent	Volume Constituent	Heat in 1 cu. ft. constituent above 60 F.	Heat in actual vol. constituent above 60 F.
CO_2	.345	90.6	31.30
O_2	.13	54.	7.0
N_2	2.02	54.	109.0
H_2O	.260	77.	20.0

Total heat 167 B.T.U. in waste gas per cu. ft. producer gas.

Therefore from 1 pound of coal a total of 72.5×167 or 12200 B.T.U. leave the combustion chamber.

HEAT BALANCE (1 LB. COAL)

Heat entering (chemical in producer gas)	10820 B.T.U.
Sensible heat producer gas	4160 B.T.U.
Sensible heat in air supplied	6300 B.T.U.
Total heat supplied	21280 B.T.U.
Total heat out with waste gases	12200 B.T.U.
Net useful heat delivered for melting and maintaining temperature	= 9080 B.T.U. per pound of coal.

It was apparent from the above that one pound of 14300 B.T.U. (as received) coal will supply 9080 B.T.U. to the melting chamber of the tank. This heat quantity is termed herein as the useful heat and is used for comparisons of fuel oil and natural gas useful heat deliveries. The method of calculation favors producer gas in the example because of the high air and gas preheat as frequently a preheat of 2000 F. to 2100 F. exists rather than the assumed 2300 F.

The object of part II is to indicate a method of calculating useful heat delivered to the melting chamber of a glass tank when producer gas is used as the fuel with regenerative glass tanks. The results are useful in comparing producer fuels of different characteristics and purchase prices as well as for securing equivalent fuel values of fuel oil and gas.

Part III, to appear later, will deal with the analysis of fuel oil as a tank fuel showing the method of attack together with the calculations for a typical high grade fuel oil. The fuel oil selected is of high gravity specification and actually classifies within the distillate group.

How to Organize an Effective Safety System for a Glass Plant

Told by C. E. RALSTON, Safety Director
Pittsburgh Plate Glass Company

THE Safety Program of the Pittsburgh Plate Glass Company is organized along the lines of the local Plant Safety Inspector and Safety Committee plan found to be the most successful in other industrial organizations, with, of course, variations to suit local conditions. Much importance is placed on the weekly meetings of the departmental as well as monthly meetings of all central committees. The plant safety inspector maintains close contact with all committees and follows through all suggestions made. In addition to handling the safety work in his plant, each safety inspector handles all compensation matters in detail as well as the group insurance. Such a program keeps him in close touch with the personnel of the organization and has a tendency to make this phase of our operations most efficient.

When this program was adopted, in the early part of 1923, it was decided that safety must be considered as an operating proposition. The same value was placed on safety regulations as was placed on other operating orders. This also applied to the cost of safety recommendations and safeguards. Very little consideration has been given to so-called safety campaigns, or safety drives, during certain periods, but the emphasis has been placed on the calendar year in each case and all contests based on that period of time.

The effectiveness of such a program is indicated in the results which have been obtained. During the year 1922, there was reported a total of 1366 lost time cases, while in 1928 there were but 216 such cases in the combined manufacturing operations. During the year 1927, there were only 173 lost time cases reported. The above reductions were made during a period of time when production increased about 75 per cent and many changes in methods of operation had been made.

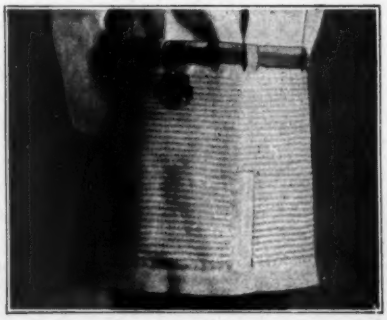
The real problem in the beginning was to secure the interest of the employes, as the executives of the company were whole-heartedly back of the movement. Due to the nature of the product handled there were many personal hazards and when an injury did occur it was usually severe. Much time was spent with the employes in small groups, explaining the real meaning of a safety program and how vital to its success was their cooperation. Cases were carefully analyzed with them and a real effort made to determine causes and fix responsibility.

In the very beginning it was apparent that body protection was very necessary. Groups of employes were requested to assist in the development of the equipment desired and with the clear

Top center: Heavy Fibre Spats, Metal Flare.

Middle center: Chrome Leather Apron, Cutter Studded Patch.

Lower center: Chrome Leather Half-Gloves, Studded Patches.

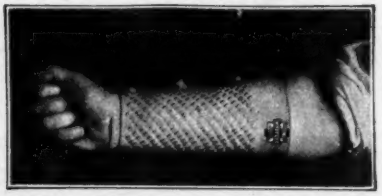


Upper left: Chrome Leather Spats, Reinforced Flare.

Lower left: Protective Device.

Upper right: Chrome Leather Arm Protectors, Steel Studded Patches.

Lower right: Chrome Leather Knee Pads, Padded.



understanding that when any such equipment was finally adopted its use would be mandatory.

First attention was given to arm protection as many serious arm and wrist injuries had been quite frequently reported. Some few of the old time employes were using cuffs or a piece of glass fell and struck the supposedly protected arm. Neat fitting, metal reinforced cuffs of chrome leather were developed and later it became apparent that further protection was needed for the wrists and as much of the hands as could be covered. The fingers could not be protected as it is necessary for the operators to feel the glass in practically all cases. The cuffs were made in various sizes in order to secure a neat fit for different size arms.

KOKOMO SAFETY AND INSURANCE CONFERENCE

Headed by the late W. J. Golightly (Front Row), General Manager of the Kokomo plant of the Pittsburgh Plate Glass Company, who died last November

L. D. Panchot R. R. Jones J. E. Jennings H. F. Myers Lee Roberts D. Atwell
Geo. Oldham Vernon Willetts T. R. Donoghue W. G. Ely Ray Bates
J. W. Straley J. Gorski
J. W. Hatfield C. O. Carson W. M. Gilruth A. I. Shomperlen J. J. Hobaugh
F. V. Pettit W. A. Patterson H. J. Hartmann Jos. Golightly H. K. Shopp R. E. Vanatta
L. E. Du Bey J. S. Dodge C. B. Dickey C. E. Ralston
W. J. Golightly

SYMBOLIC BROOM HOISTED BY THE WINNING DEPARTMENT EACH MONTH

made of heavy hard leather. These were found to be far from satisfactory as the leather dried out in time and then readily cut when in contact with the sharp edges of glass

Similar protection was developed for the feet and glass cuts began to disappear from our reports. In some cases special foot protection with metal guards over the feet were attached to chrome leather covering the ankles and shins.

Suitable aprons were next developed and have also been a great aid in the reduction of cases from handling glass in the various stages of operation, but particularly in the cutting and wareroom sections.

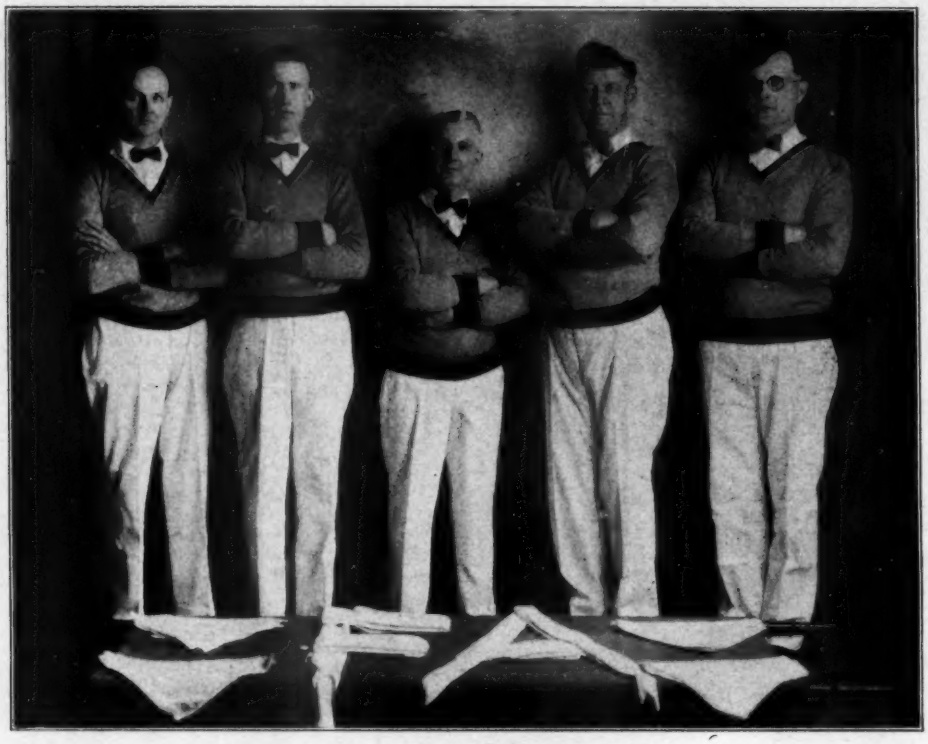
In the examining work many cases of bad knees were formerly quite common. To meet this situation, a chrome leather knee pad was developed—using heavy leather and a pad of heavy felt. The leather of this pad was made long enough to extend above the knee and thus form an apron to prevent small pieces of glass entering between the pad and the knee. These pads have proved very satisfactory and rapidly became popular with the examiners who spend much time on their knees. They also made an appeal to the rough cutters.

Hand laps of both leather and rubber were also developed for conditions where they could be used to an advantage. In all cases the hazards of the operations were carefully studied and it is safe to say that the reduction in medical costs, as well as time lost, has more than paid for the equipment provided. In all cases it is a case of "wear the pro-

tective equipment or no job." In no other way can a safety program be successful.

Wherever practical, mechanical devices have been developed and installed to reduce the exposure of handling glass by hand. Possibly the one device that has been the most valuable in this respect has been the introduction of the vacuum frame for handling large sheets of plate glass. Rubber vacuum cups replace clamps, hooks, etc., formerly used for this purpose. This device, while developed from an efficiency standpoint, has proved to be a wonderful safety factor in reducing the exposure of the employes.

The interest of the employes is stimulated not only by well kept illuminated safety bulletin boards, but in some cases by banners located over aisles where they can be readily seen and read. These banners are changed from time to time and new slogans displayed, always using bright colors and clear lettering. White and green are always the predominating colors and red is never used in connection with the safety work. The red is reserved for the use of the Fire Department only.



FIRST AID TEAM AND THEIR EQUIPMENT

Goggles are required to be worn wherever there is an eye hazard and in some operations there are many. Good vision is a very necessary thing in the glass industry, as well as in others, and every employe is given a very complete examination. Where defective vision is found the em-

HOUSEKEEPING LEAGUE BULLETIN BOARD

PITTSBURGH PLATE GLASS COMPANY
SAFETY TROPHY
UNIVERSAL SAFETY
FIRST QUARTER PAINT FACTORY MILWAUKEE, WIS.
SECOND QUARTER PAINT FACTORY MILWAUKEE, WIS.
THIRD QUARTER WORKS No 1 CREIGHTON, PA.
1928
FOURTH QUARTER WORKS No 5 FORD CITY, PA.
YEAR-RESEARCH & LABORATORIES DEPT. CREIGHTON, PA.
IT IS THE DUTY OF EVERY MAN TO PROTECT HIMSELF, & THOSE ASSOCIATED WITH HIM FROM INJURY

SAFETY TROPHY TABLET

ployе is required to procure and wear glasses, or goggles with corrective lenses. This is an important part of our physical examination program which is used for the better placement of our people.

Housekeeping receives real attention and in some cases has been producing startling results. Regular contests are carried on and much interest is taken in maintaining clean departments. The best department is permitted to display during the following month a large broom mounted in a frame of colored electric lights. The use of a slogan such as "Don't throw down things that must be picked up" soon has its effect on all concerned and saves much in janitor service. A regular system of merits and demerits is used for equipment and tools out of place as well as dirt or an untidy work area.

A full time Safety Contest is carried on in each plant as well as between all plants. Each plant has an Inter-department Safety Trophy which is awarded each month to the department with the best record. The Inter-Plant Trophy is awarded at the end of each quarter and permanently at the end of each year. The basis of award is greatest percentage of reduction in days lost per 1000 hours worked, over the previous period. In order to reach the individual, attractive watch fobs are awarded to each employe in a department which completes a calendar year without a lost time case—and only to those employes who have been in the department for the full period.

Each plant has its own First Aid Station under the care of a registered nurse. These stations are very completely equipped for all classes of cases and are supervised by selected surgeons who take entire charge of the injured employes. The decision of the surgeon is final as to whether the case is one to be charged as a lost time case or not. Our surgeons are given full authority with respect to all treatments, hospitalization, consultations, etc., in order that the very best results for our people may be obtained. We require all employes to report at once to the First Aid Station in case of injury regardless of its severity. Failure to so report usually results in disciplinary action and if an employe fails to report within the day, or shift, he may be laid off for a corresponding period of time. For the second offense the lay off is usually ten days, while for a third offense the offender is subject to discharge. As one result of this procedure we seldom have an infection.

First Aid Instruction is encouraged in all plants and particularly resuscitation by the prone pressure method. Many of the plants have well trained First Aid Teams which have done excellent work both inside and out of the plants. Teams of First Aid Workers are a valuable asset to any plant or community and in many instances have rendered very valuable and efficient service. We cannot commend them too highly for the work they are doing.

While our program as outlined above concerns itself mostly with the human element we do not overlook the physical conditions in our plants. The latter can readily be handled, or corrected, as conditions would warrant, but the main problem is to gain and maintain the interest of each and every employe. Wherever mechanical hazards are found, or reported by the employes, early attention is given to their correction. The necessity for immediate action is impressed on our entire supervisory force—as a safe working condition is the company responsibility. Defective tools or equipment are taken out of service wherever detected and as a result very few injuries are reported from this cause.

In order to keep our safety organization posted on all operations and working in the most efficient manner, our Annual Conference is held. This Conference is held in a different plant each year and three days are given over to an intensive Safety Program which covers all phases of our work, including Safety, Insurance, Fire Protection and other related subjects. The conference is attended by all the safety inspectors and some plant managers. Each is assigned a paper on some subject relating to our various problems and much good results as the discussions are participated in very freely and frankly by all in attendance. The Conference of 1929 was held at Kokomo, Indiana, and was attended by thirty men—representing all our operations except two on the Pacific Coast. Such conferences are extremely beneficial as definite company problems can thus be worked out in detail by experts who are devoting their entire time to such matters. One evening session devoted to Community Safety is held and representatives of neighboring industries are invited to attend and participate.

Effect of Ultraviolet Radiation on Window Glass

After Initial Solarization Exposure to the Mercury Arc Lamp Produces a Further Decrease in Transmission

For the past two years the Bureau of Standards has been making as extensive study of the effect of ultra-violet light upon the transparency of window glasses and glass substitutes to be used for transmitting short wave length ultraviolet radiation (1) from artificial sources and (2) from the sun. Part of the information thus obtained is given in Bureau of Standards Journal of Research, Vol. 3, No. 5, p. 629; November, 1929. The reprints of this article, Research Paper No. 113, will soon be available from the Superintendent of Documents, Government Printing Office, Washington, D. C.

One of the high points recorded in this paper is that some of these glasses and glass substitutes undergo a photo-chemical change, with a marked decrease in the transmission of ultraviolet radiation, which render them unsuitable for filters of artificial sources radiation.

Another point of interest mentioned in that paper is that the unfiltered radiation from artificial sources seemed to produce a somewhat greater decrease in transmission than sunlight, but that sufficient time (one year) had not elapsed to determine whether the glasses which were exposed to the sun had attained a minimum transmission. It now appears

from a further study of these various makes of glasses which have now been exposed to the sun and weather continuously for 1½ to 2 years (some samples were exposed through 2 winters and 2 summers) that, within the experimental errors of observation and handling of such material, there is no appreciable recovery or increase in transmission in winter above the minimum value attained in summer; also that it requires an exposure of 3 to 4 months to the hot summer sun and weather to make certain that solarization is fairly complete, especially in some makes of glass that solarize but slowly.

After this initial solarization an exposure of these glasses to the mercury arc lamp produces a further decrease in transmission, varying from 1 to 8 per cent at 302 millimicrons, depending upon the sample tested. The difference in the decrease in transmission produced by these two methods of so-called photochemical stabilization is small, averaging less than 6 per cent for the earlier productions of Helioglass, Holviglass, Sunlit, and Vitaglass, and it does not modify the rating of the relative performance of these glasses (see Table 2, of Research Paper No. 113) in which the public is interested. For example, the average transmission of the samples of Helioglass described in Table 2 of Research Paper No. 113, after stabilization by exposure to the sun would be expected to be 46 per cent as compared with 40 per cent under the mercury arc. Similarly the earlier productions of Vitaglass will probably attain an average minimum transmission of 29 per cent in the sun as compared with 23 per cent observed after exposure to the mercury arc lamp.

As mentioned on page 652 of Research Paper No. 113, the stabilization tests under the mercury lamp indicated that the newer productions of Helioglass and Vitaglass showed an improvement in transparency. This has now been verified by exposure of these glasses to the sun for 10 months. For example, the sample of Vitaglass, which transmitted 62 per cent when new, decreased in transmission to 43 per cent after solarization for 10 months and to 30 per cent after exposure to the mercury lamp. Similarly, a recent production of Helioglass transmitted 68 per cent when new, 59 per cent after solarization for 10 months, and 46 per cent after exposure to the mercury arc—a difference of about 13 per cent produced by these two methods of depreciation. The relative performance of these glasses remains the same.

Recently it was found by Wood and Leathwood (Nature, September 21, 1929, THE GLASS INDUSTRY, 10 p. 276, Nov., 1929) and by the Bureau of Standards that exposure of the glass to the sun after exposure to the mercury arc lamp increases the transmission in the ultraviolet to closely the minimum value that was obtained by exposure only to the sun. In fact, in the Bureau of Standards' tests, which were made on glasses that had been exposed to the sun for a long time before exposure to the mercury arc, it was found that, on further exposure of these glasses to the sun for 90 hours, after exposure to the lamp, the transmission increased to a higher value than the minimum attained by exposure only to the sun. This overshooting in transmission, which ranges from 1 to about 6 per cent above the minimum attained by exposure only to sunlight, occurred in 17 out of 20 samples of different makes of glass, including Helioglass, Holviglass, Neuglas, Ultra-Violet Glass, Ultravit, and Vitaglass. Whether this condition remains permanent will require measurements on these glasses after further exposure to the sun especially during the summer. At present they are still increasing in transparency. This recovery in transmission appears to be selective to certain wave lengths of the exciting light. For example, one sample of glass was exposed to the mercury arc and then cut into nine pieces, one of which was exposed directly to the sun. The others were exposed under black paper (opaque to all rays) and under filters which transmitted bands of infra-red, red, yellow, green, blue, violet, and ultraviolet rays of the sun. The recovery in transmission was practically the same under all these fillers except the ultraviolet, Corex G986A, which produced the greatest recovery, and Corning pale blue green, G584, which produced the second greatest recovery. From this it appears that the spectral region of 365 millimicrons produces the greatest recovery in transmission.

It is to be noted that all these depreciation tests on different kinds of glass were made in duplicate, by exposure (1) to the mercury arc lamp (and other artificial light sources) and (2) to the sun, and that in all makes of glass (except Corex A) a close similarity was found in the depreciation in transmission produced by these two sources of ultraviolet radiation. That is to say, glasses (for example, Corex D), which undergo little or no change in transmission on exposure to the mercury arc, undergo no appreciable change in transmission on exposure to the sun; and glasses, also different melts of the same kind of glass, which show the greatest decrease in transmission on exposure to the mercury arc, show the greatest decrease in transmission on exposure to the sun. All deductions regarding the depreciation in transmission of different makes of glass and different melts of the same kind of glass are based upon experiments in sunlight, supplemented by experiments with artificial sources of radiation, leaving no doubts regarding their performance.

It seems impracticable to spend several months (preferably summer) in order to obtain the performance of every melt of glass by exposure to the sun. The depreciation in transmission by exposure to the mercury arc appears to be a little more severe than sunlight. But in view of the fact that differences of 10 to 22 per cent in transmission are found in new samples of certain kinds of glass, selected at random from the same shipment (and presumably from the same melt), the mercury arc appears to be a ready means for determining, in a few (three to five) hours, the so-called stabilized transmissive properties of a batch of glass. From these data, and from the above-mentioned corrections, the transmission that it will probably attain after solarization by prolonged exposure to the sun can be predicted.

Investigating Die Metals for Plastic Clay

The abrasive action of plastic clay in flowing through dies wears the liners rapidly and makes necessary frequent new ones. The Bureau of Standards at Washington has undertaken an investigation of the resistance of metals suitable for dies to the abrasive action of plastic clay. The work includes tests of different kinds of cast iron, steel and bronze. Tests already made of a cast iron die and a carbon-chrome steel die indicate that a clay column can be extruded from a carbon-chrome steel die ten times longer than a cast iron die before the two dies show equal abrasive losses.

Photo courtesy Canadian Pacific Railway

TORONTO'S MODERN SKY AND SHORE LINES

[The large building in the center is the Royal York Hotel, where the Glass Division and other divisions of the American Ceramic Society will have their headquarters and hold their meetings. It was built by the Canadian Pacific Railway at a cost of $16,000,000. It is 28 stories high, has 1060 rooms and is the tallest building in the British Empire.]

Glass Division Program for Toronto Meeting

Gives Promise that Many Interesting Subjects Will Be Discussed

TORONTO, "Queen City of Canada," often considered by widely-traveled visitors to be one of the most attractive cities on the continent, will be the focus of the annual pilgrimage of the Glass Division and other Divisions of the American Ceramic Society which with the American Refractories Institute will meet at the Royal York Hotel in that city February 16 to 21, 1930.

The name "Toronto," though the fact seems not to be widely known, was inherited by the city from its predecessors, early native Indian tribes which chose the location as a convenient gathering place, possibly for the purpose of trading pelts for powder and furs for firewater, and called it *toronto*, a word that meant in their language, "place of meeting." Toronto therefore has always been more or less of a convention center and is constantly becoming more so. Quite recently a successful meeting of the Glass Container Association was held there.

Toronto is the capital of the Province of Ontario. Situated on the north shore of Lake Ontario the city has ample facilities for water transportation and numerous opportunities for aquatic recreation which are taken full advantage of by the population in the summer season and even in winter by ice boats and skaters when conditions are favorable.

There are many interesting things to see in the city. Situated in the southern end of Queen's Park the Ontario Parliament buildings of massive and impressive construction cover four acres of ground. A number of colleges are located in the same vicinity. The University of Toronto, owned by the people of Ontario, was founded in 1827. It numbers among its graduates many men and women of outstanding importance in the various walks of life not only in Canada but in other countries.

The Royal Ontario Museum is devoted to exhibits showing the natural history of the world, including evolution. It includes a zoological department and a museum of palaeontology. The archaeological museum contains many specimens of man's work from prehistoric times onward. Included is a series showing the history of glass and glazed pottery many other articles and a particularly good exhibit of Chinese art. The Art Gallery of Toronto is devoted largely to sculpture.

The city is well provided with parks. The Canadian National Exhibition where Canada's natural products and manufactures are annually displayed on a large scale is famous the world over. In Chorley Park is the Ontario Government House, a large handsome structure, the official residence and home of England's representative in Ontario.

The Meetings

The meetings of the American Ceramic Society and the American Refractories Institute at the Royal York will open on Sunday, February 16, with registration of visitors, meetings of trustees and committees and at 2 p.m. a tour through Toronto to the Royal Ontario Museum, followed by a tea and reception at the hotel. At 8 p.m. there will be a lecture by T. S. Curtis, of the Vitrefrax Company, illustrated by colored motion pictures, on crystal development. At 9 p.m. there will be a musical recital at the Royal York by Canada's largest organ and choir with 200 male voices.

On Monday, February 17, a general session will be held.

At 10 a.m. President George A. Bole will address the meeting. The report of the general secretary Ross C. Purdy and reports of committees will be heard. At 12 noon there will be a luncheon with an address on Management by W. Keith McAfee, chairman. At 2.30 p.m. there will be a public meeting under the auspices of the art and terra-cotta divisions including a lecture by Brig.-General C. H. Mitchell, Dean of Faculty of Applied Science and Engineering, University of Toronto. Subject: "Faience and Pottery of France" illustrated by colored slides. An illustrated lecture by Prof. Rexford Newcomb, Department of Architecture, University of Illinois. Subject: "Brick and Tile in the Orient." "The Role of Art in Industrial Ceramics" by Edmund de F. Curtis, Philadelphia Museum and School of Industrial Art, Philadelphia, Pa.

In the afternoon the women of the party will be conducted through the shops of Toronto and visit the Museum. At 5 p.m. tea will be served at the hotel. At 6.30 p.m. group dinners by colleges.

On Tuesday beginning at 9.30 a.m. and continuing through the day there will be meetings of the seven divisions. In the evening there will be an O. H. A. hockey game at Arena—Queen's vs. Rangers—followed by a buffet luncheon at the hotel.

On Wednesday, beginning at 9:30 a.m. division meetings will be continued. At the noon luncheon there will be a talk on "factory process" by H. M. Kraner. At 2 p.m. division meetings. In the evening a banquet will be held at which the toastmaster will be Brig.-General Mitchell. On Thursday and Friday ceramic plants in Toronto and other cities will be visited.

The papers on the preliminary program, to be presented at the meetings of the Glass Division and some of those of the Refractories Division and American Refractories Institute are listed below.

Glass Division Program

1. Electrical Glass Melting. By T. J. Burt-Gerrans, University of Toronto, Toronto, Can.
2. Physical Behavior of Glass. By H. P. Gage, Corning Glass Works, Corning, N. Y.
3. Electrical Methods for Determining Moisture. By E. F. Burton, University of Toronto, Toronto, Can.
4. The Use of Polariscopes in the Glass Industry. By Frank W. Preston, Butler, Pa.
5. Corrosion of Tank Blocks by Opal Glass. By C. J. Uhrmann, Inland Glass Works, Chicago, Ill.
6. Discussion: Opacifiers for Glass. By A. Silverman, University of Pittsburgh, Pittsburgh, Pa.
7. Production of Glassmakers' Feldspar. By Rudolph Glatly, Feldspar Milling Co., Burnsville, N. C.
8. Beryllium Glass, II: Potassium Beryllium Silicate. By A. Silverman and Chi Fang Lai, University of Pittsburgh, Pittsburgh, Pa.
9. The Physical Properties of a Series of Soda-Lima Magnesia Glasses. By W. C. Rueckel and J. W. Gill, Ohio State University, Columbus, Ohio.
10. The Effects of Additions of ZnO and CdO of Simple Glasses. By C. W. Parmelee and D. T. Shaw, University of Illinois, Urbana, Ill.
11. The Electrochemical Behavior of Glass. By J. B. Ferguson, University of Toronto, Toronto, Can.
12. 12:30—Glass Division Luncheon (Tuesday).
13. Progress Report on Bureau of Standards Investigations of "The Effect of Dissolved Gases in Glass." By R. C. Darnell, Bureau of Standards, Washington, D. C.
14. Modified Method for Decomposing Aluminous Silicates for Chemical Analysis. By A. N. Finn and J. F. Klekotka, Bureau of Standards, Washington, D. C.
15. Some Dimensional Changes Caused in a Pyrex Glass by Heat Treatment. By A. Q. Tool, Bureau of Standards, Washington, D. C.
16. Action of Dust from the Batch on the Checker Brick of Glass Furnace Regenerators. By D. S. Beliankin and M. A. Besborodov, Mineralogical Laboratory, Polytechnic Institute in Leningrad.
17. Thermal Expansion of Glasses by a Photographic Recording Device. By Willi M. Cohn, Berlin, Germany.
18. Notes on the Chemical Analysis of Glass. By G. E. F. Lundell, Bureau of Standards, Washington, D. C.
19. The Effects of Additions of Zinc Oxide and Cadmium Oxide on Simple Glasses. By C. W. Parmelee and R. G. Ehman, University of Illinois, Urbana, Ill.
20. Observations on the Electrical Breakdown of Solid Insulating Materials. By J. T. Littleton, Corning Glass Works, Corning, N. Y.
21. Mechanical Properties of Some Rolled and Polished Glass. By E. M. Guyer, Corning Glass Works, Corning, N. Y.
22. Viscosity Measurements. By H. R. Lillie, Corning Glass Works, Corning, N. Y.

Refractories Division and American Refractories Institute Program

New Silica Refractory. By C. B. Frederick, Jr., Portsmouth Firebrick Co., Portsmouth, Ohio.

Refractory Clays of Moose River Basin. By R. J. Montgomery and W. S. Dyer, University of Toronto, Toronto, Can.

Thermal Expansion of Fire Clays. By R. A. Heindl, Bureau of Standards, Washington, D. C.

Thermal Expansion of Silica Brick and Mortars. By S. S. Cole, Mellon Institute, Pittsburgh, Pa.

Crushing Strength of Fire Brick. By H. Mitra, Bureau of Standards, Columbus, Ohio.

Service of Mullite. By T. S. Curtis, Vitrefrax Corp., Los Angeles, Calif.

Round Table Discussion: (a) Economical Design of Refractory Shapes; (b) Foremanship Training; (c) Following and Handling of Orders in the Plant; (d) Books for Use in Plants.

The Causes and Prevention of Bulging in Hand Molded Refractory Shapes. By Gordon B. Richardson.

Progress Report on Checker Brick Investigation. By R. M. King, Ohio State University, Columbus, Ohio.

The chairman of the Canadian Committee in charge is Brig.-General C. H. Mitchell, Dean of Faculty of Applied Sciences and Engineering, Toronto University. J. H. Sephton of the Dominion Glass Company, Hamilton, Ontario, is Glass Division Representative on the Committee.

The Royal York hotel has made a special rate to members of $5.00 a day for single room and $8.00 for two persons in a double room.

Exhibits of light ceramic equipment and materials will be placed in the Convention floor foyer and in the lounge on the mezzanine floor.

Nominations for Officers, 1930-1931

The two Nominating Committees completed their slates some time ago, as follows:

	Committee No. 1	Committee No. 2
For President,	Edward Orton, Jr.	Edward Orton, Jr.
For Vice-President,	Paul E. Cox	Alexander Silverman
For Treasurer,	H. B. Henderson	H. B. Henderson

General Orton Defines His Platform

The unanimous sentiment of the committees in favor of General Orton's nomination having been made known to him and an invitation extended to accept the nomination, he advised the Committees on November 5, 1929, that he had decided to allow his name to go in and if elected would serve the Society to the best of his ability. He stated that he felt that unless he could render some outstanding service his election would not be justified.

In his letter to the Committee, published in the December issue of the Society *Journal*, General Orton stated that in his opinion there is one service the Society needs to have done for it which

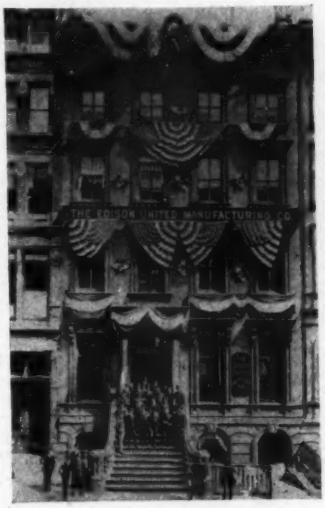
(Continued on page 20)

Our Great and Growing Glass Bulb Industry

Past Year's Production Figures Show Immense Consumption

UNTIL fifty years ago the incandescent electric light bulb existed only in the imagination of Thomas Alva Edison, whose successful invention of half a century ago has been widely celebrated during the past year throughout North America and in many other parts of the world, as one of the greatest blessings ever bestowed on mankind.

The record of the enormous and increasing success of the incandescent electric lamp during its half-hundred years of existence is almost like a fairy story. The original half-dozen or so incandescent electric lamps used in the first successful demonstration of Edison's invention in New Jersey laid the foundation for a great industry—glass bulb manufacture—in this day. During the past year this industry has provided nearly three-quarters of a billion glass bulbs and is fast increasing its volume. There is an average production for each inhabitant of the United States of over six bulbs.



FIRST BUILDING ILLUMINATED BY ELECTRIC LIGHT
First electric sign "Edison" (in doorway) about 1888, at 65 Fifth Avenue, New York.

There is probably no industry more progressive and alert to its opportunities than the glass bulb industry. Frequent and revolutionary improvements have more than doubled the output of the original Westlake machine from which a few years ago a large part of the total production came. One modified type of Westlake machine has been so improved that it is said to be capable of producing 110,000 standard lamp bulbs per day of 24 hours.

An entirely new and revolutionary method of making bulbs has been developed and is in use by the Corning Glass Works. Because of the new principles on which the process is based a production almost unbelievable even to experienced glassmen has been attained exceeding 300,000 bulbs a day, and it has been said that the men who developed the invention confidently look forward to attaining eventually by this process an even larger output.

A new method for the inside frosting of bulbs greatly reduced the time required for that operation and put it on a mass production basis.

Substantial savings in production costs were effected by these radical inventions and a liberal part of them have been passed on by the bulb companies to the consumer in the form of reduced retail prices for bulbs.

The principal manufacturers of glass bulbs in the United States are the Corning Glass Works of Corning, New York, who produce bulbs at several plants, and the Incandescent Lamp Department of the General Electric Company which controls the National Lamp Works at Nela Park, Cleveland, and several other factories. There are of course a number of other makers especially by special shapes and miniature bulbs but their combined production is very small compared with the total production of standard sizes of incandescent lamps.

Figures obtained from an authoritative source on the total United States consumption for the year 1929 are tabulated below for the different types of bulbs.

The total exports of bulbs for 1929 amounted to 19½ million of which 5½ million were for the manufacture of miniature lamps and the balance for what is termed large lamps.

Imports of glass bulbs are not classified as to their ultimate use but assuming that substantially the same proportion of large and miniature electric lamps are made from the imported glass bulbs that holds good in domestic production, it would seem fair to assume that 8,800,000 bulbs or 55 per cent would be used for the manufacture of large lamps and 6,400,000 or 45 per cent would be used for miniature lamps.

According to a statement made public December 28 by John Liston of the General Electric Company through that organization's News Bureau, the 1929 sales of incandescent electric lamps exceeded that of all previous years, being the largest in the history of the industry.

On March 1, 1929, 50- and 60-watt standard lighting lamps of the 115-volt group were reduced in list price from 22 to 20 cents so that the 20-cent price now covers all the generally used lamps up to and including the 60-watt size. The price trend for lamps has been downward for a number of years; the present prices being less than half the so-called pre-war figure.

Compare this with the present cost of living, which is now 60 per cent above the pre-war level, a peak of 100 per cent increase having been in effect during 1920. While the average prices of lamps did go up during the post-war period, their increase was less than one-tenth that of the increased cost of living during the same period.

CONSUMPTION OF GLASS BULBS, UNITED STATES, 1929.

	Quantities Expressed in Even Millions	Percent Increase over 1928
(a) For use in the manufacture of what is termed large lamps, comprising all such which are not included in the group below	324	17
(b) For what is described as miniature lamps, including flashlight, automobile, Xmas tree and miscellaneous	330	22
(c) For vacuum tubes	105	75
Total	759	23

Summing up the situation, it is a fact that at an estimated average price of 20 cents each, the people of the United States are freely spending approximately $150,000,000 a year, considerably over one dollar each, for the common glass bulbs and metal fittings used everywhere.

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Washington Meeting to Act on Feldspar Specifications

The work which the Feldspar Grinders' Institute has been actively prosecuting since last spring on the compilation of standards for the feldspar industry has taken form in a Proposed Commercial Standard for Feldspar which will be submitted to the industry for discussion, recommendations, and vote of approval at a meeting to be held in the East Lecture Room, Bureau of Standards, Washington, D. C., at 10 a. m., Tuesday, January 14, 1930.

The Bureau, through the cooperation of its Division of Trade Standards is acting as an unbiased agency in bringing together the various interests of the industry in a general conference for frank discussion and has announced that all interested parties are invited to attend and take part in the meeting. Those not able to be present are requested to convey their ideas and comments on the proposed Standard to the Division of Trade Standards in writing.

In a communication to the trade, Commissioner W. J. Parker of the Institute outlines some of the benefits of standardization, as follows:

The beneficial results from commonly recognized classifications for feldspar are manifold. The entire industry will be talking in understandable language. No longer need the feldspar grinder and his consumer be put to the expense of time and money through telegraph charges, railroad demurrage, and perhaps litigation over a mere misunderstanding.

With well defined classifications, the feldspar user can accurately specify the type of material he needs without leaving it to the hit or miss fashion of merely saying "same as the last car." Furthermore, recognized classifications of quality provide a definite basis of comparison for the purchaser and tests will readily show whether or not the material is of the proper grade.

Another confusing element that standard classifications will eliminate is in the matter of fineness tests or screen analyses. Many of us have loosely talked of spar of 100 mesh or 120 mesh, but what do we mean by mesh? The answer, of course, is the number of openings per inch of wire—but the wire diameter is the all-important point and must also be known.

The proposed standard classifications will all be based on screens of the United States Standard Sieve Series, which in recent years, have become the recognized basis for physical tests recommended by the American Ceramic Society, American Society for Testing Materials, Abrasive and Grinding Wheel Manufacturers' Association and other such organizations.

By the use of standard screens, both buyer and seller of feldspar have the same basis of comparison, and misunderstanding on this basis is obviated.

Rule of thumb methods in the ceramics industry are being rapidly crowded out by closer technical control.

Elimination from the industry during the ten years just past of 98 glass factories gives a clue to the fate of plants that fail to adopt modern practices such as standardization in production operations.

Commercial Standard for Ground Feldspar

U. S. Bureau of Standards Co-operates with Institute to Obtain Its Adoption

THE efforts of the feldspar producing industry, concentrated in the Feldspar Grinders Institute, to improve conditions in the trade by adopting rules and practices that tend to prevent the occurrence of misunderstandings and disputes within the industry itself and between producers and consumers, and to eliminate all questionable practices throughout the trade have culminated in arrangements that have been made for a meeting in January at the Bureau of Standards in Washington to discuss and act on a proposed standard for feldspar, the details of which are given in full below.

Proposed Commercial Standard for Feldspar

I. SCOPE

THIS Commercial Standard covers ground feldspar used in the production of ceramic products, based on particle size and chemical composition.

II. GENERAL REQUIREMENTS

All screen tests shall be made on standard screens (U. S. Standard Sieve Series), the opening sizes and diameters of which are appended to Table I and according to the standard method of testing described below.

All chemical analyses shall be made according to the standard method as described below.

III. DETAIL REQUIREMENTS

*A. Physical Classification Based on Fineness of Grinding**

TABLE I

Mesh				Standard Screens Openings in Inches		
U. S. Standard Sieve Series No.	Mfrs. No.	Percentage Remaining on 200 Mesh Screen	Maximum Percentage on Mesh Designated	U. S. Std. Sieve Series	Per Cent Tolerance in Average Opening	Mfg. Std.
230	250	0.00-0.35	1.0	.0024	±8	.0024
200	200	0.35-1.00	1.0	.0029	±8	.0029
170	170	1.00-2.50	1.0	.0035	±8	.0035
140	150	2.50-5.00	1.0	.0041	±8	.0041
120	115	5.00-9.00	1.0	.0049	±6	.0049
100	100	9.00-14.00	1.0	.0059	±6	.0058
80	80	14.00-21.00	1.0	.0070	±6	.0069
60	60	21.00-30.00	0.6	.0098	±6	.0097
40	35	30.00-42.00	0.3	.0165	±5	.0164
20	20	42.00-62.00	None	.0331	±5	.0328

*Fineness classification shall be made on a basis of the percentage remaining on the standard 200 mesh sieve and that remaining on the sieve of the designated mesh. Example: 140 mesh product will have 2.5-5.0 per cent remaining on the 200 mesh sieve and less than 1 per cent on the 140 mesh sieve.

B. Chemical Classification Based on Composition as It Influences Use

The first group includes the commonly accepted ceramic or body grades based on silica content and alkali ratio and containing less than 4 percent soda (Na_2O) content.

The silica number and ratio numbers are to be used in combination. For example: Grade No. 68-51 designates a spar of silica content up to 68 percent and with 5 or more parts of potash (K_2O) to 1 part of soda (Na_2O).

Number	*Silica* (SiO_2) *Content*
68	Up to and including 68 percent
69	Above 68 percent up to and including 70 percent
70	Above 70 percent up to and including 72 percent
72	Above 72 percent

Number	*Potash* (K_2O)—*Soda* (Na_2O) *Ratio*
51	5 or more potash to 1 soda
41	More than 3 and less than 5 potash to 1 soda
31	3 or less potash to 1 soda

The second group includes the spars used chiefly for glazing purposes which are based on soda content and contain 4 percent or more soda (Na_2O).

Number	*Soda* (Na_2O) *Content*
4	4—5 percent not including 5 percent
5	5—6 percent not including 6 percent
6	6 percent and above.

The third group includes spars used for the manufacture of glass. These are based on alumina (Al_2O_3) content.

Number	*Alumina* (Al_2O_3) *Content*
15	Below 16 percent not including 16 percent
16	16—17 percent not including 17 percent
17	17—18 percent not including 18 percent
18	18—19 percent not including 19 percent
19	19 percent and above.

The fourth group are "off color" spars based on iron content

	Iron Oxide (Fe_2O_3) *Content*
X	0.17—0.50 percent not including 0.50 percent
XX	0.50—1.00 percent not including 1 percent
XXX	1.00 percent and above.

IV. STANDARD METHODS OF TEST

A. Physical Test

MESH OR FINENESS.—A 100 gram portion of the dry sample is weighed out to an accuracy of 0.1 gram. It is then transferred to the 200 mesh sieve and over a sieve pan which fits closely enough to prevent loss by slopping. The pan shall contain sufficient water to reach within not less than ¼ in. or more than ¾ in. from the top of the pan. The sieve and pan shall be vibrated or shaken in such a manner that water in the pan is splashed on the screen from below, so as to wash the powder about and cause the material that can pass through the sieve to pass into the pan below. This treatment shall be continued until no appreciable amount is passing through. The contents of the screen are then washed into a pan and thoroughly dried. The dried material is then placed on the coarsest sieve to be used. The finer screens including the 200 mesh are placed in order of size under the coarsest, the 200 mesh being at the bottom. The tier of screens is then shaken until no more than 0.05 of a gram passes any screen after 1 minute of shaking each time. This point is determined by weighing the residue on the coarsest screen, reshaking for a minute until finished, then going to the next size and repeating the process.

B. Chemical Tests

PRECAUTIONS

All work shall be checked agaist the Bureau of Standards, Standard Sample No. 70 Feldspar.

Dry sample at 105—110° C.

Correct results by blanks on reagents.

Factors to be determined from latest molecular weights.

SILICA.—Fuse 1 gm. sample with 6 gms. sodium carbonate in 25 cc. platinum crucible. Gradually raise flame to full heat and continue until fusion is quiescent. Rotate while hot to cause it to solidify in a thin sheet on the sides of the crucible. Remove with water and stirring rod to a 250 cc. casserole. Add hydrochloric acid in excess gradually to avoid spattering, keeping cover glass on casserole. Heat and stir until carbonates are dissolved. While taking up with acid, as above, let crucible stand with a little hydrochloric acid and water to fill it. Transfer this crucible content to casserole and wash. Break up remaining lumps with stirring rod. Remove and wash cover glass. Evaporate in casserole to dryness, taking care not to over heat. Moisten with concentrated hydrochloric acid, add equal volume of water, place on bath on hot plate for 5 minutes, add about 100 cc. water, heat 5 minutes and filter boiling hot. Wash twice with 1/3 hydrochloric acid, once or twice with cold water, then wash with *hot* water until free from chlorides. Evaporate filtrate and washings in same casserole. Dehydrate at 120° C. for 30 minutes. Moisten with hydrochloric acid and equal volume of water, heat 10 minutes. Dilute with 100 cc. water, heat to boiling and filter through second filter. Wash with cool dilute hydrochloric acid (1:99). Transfer filters

to platinum crucible, weighed, and placed over flame so that heat strikes cover and is reflected onto filters. Dry in this manner with low flame. When charred on top, move flame to base of crucible, raise flame and ignite with cover slightly ajar until nearly white, then blast 20 to 30 minutes with cover tight. Cool 30 minutes in desiccator and weigh as SiO_2 plus impurity. Moisten with 1/4 sulfuric acid, add 10 cc. hydrofluoric acid and stir with platinum wire until dissolved. Evaporate and remove sulfuric acid over flame. Ignite strongly for a minute or two, giving air free access to crucible, and weigh as Al_2O_3 plus Fe_2O_3 residue. Subtracting this residue from the silica plus impurities gives the SiO_2 content.

Alumina (Al_2O_3) *and Iron Oxide* (Fe_2O_3)—Dilute silica filtrate to about 300 cc. and heat to boiling. Add two drops methyl red then ammonia to color change. Boil one or two minutes and filter at once. Wash twice with 2 percent ammonium chloride. Dissolve precipitate through filter into original beaker with 1/2 hydrochloric acid. Punch hole in filter and wash clean. Dilute to 300 cc. Tear up filter and place in beaker with the dissolved precipitate. Precipitate and filter at boiling as above. Wash five times with hot 5 percent ammonium chloride solution. Test filtrate and if precipitate appears, filter it separately. Wash and add residue to large precipitate. Ignite wet in crucible holding silica residue, or tared crucible in the same manner as for silica. Care must be taken to see that carbon is burned off in the bottom as it is often necessary to turn the precipitate over with a platinum wire. Cool, weigh, and subtract the weight of the empty crucible to obtain the weight of "Al_2O_3 plus Fe_2O_3."

Lime (CaO).—Combine the filtrates from the Al_2O_3 plus Fe_2O_3, dilute to about 400 cc., boil and slowly add 10 cc. of a hot 4 percent solution of ammonium oxalate. Let solution set over night in warm place. Filter and wash with 0.1 percent solution of ammonium oxalate. Dissolve residue in hydrochloric acid. Add ammonia and precipitate as before, this time adding a small amount of oxalate. Filter, wash, ignite and weigh as CaO.

Magnesia (MgO)—Acidify calcium filtrates. Add an excess of a saturated solution of secondary ammonium phosphate ($(NH_4)_2 HPO_4$), then ammonium hydroxide slowly and with stirring until the solution is ammonical and finally add 10 cc. in excess per 100 cc. of solution. Set over night, filter and wash immediately with dilute ammonia hydroxide (5-95). Dissolve the precipitate in dilute hydrochloric acid (1-9), add 1-3 cc. of saturated phosphate solution and precipitate as before. Ignite cautiously and at a low temperature until carbon is destroyed and then at 1100-1150° C. Weigh as $Mg_2P_2O_7$ and calculate as MgO.

Soda (Na_2O) *and Potash* (K_2O).—Take 0.5 gm. sample. Grind fine in agate mortar. Add 0.5 gm. ammonium chloride and grind mixture to impalpable powder. Add 3 gms. precipitated calcium carbonate and mix *thoroughly*. Transfer to glazed paper, then to 25 cc. platinum crucible. Clean mortar with 1 gm. calcium carbonate and add to crucible contents. Cover crucible with a snugly fitting cover and place over flame in one-eighth inch thick asbestos sheet so that a little less than half of the crucible is exposed to the flame. Heat gently so odor of ammonia is just plainly distinguishable. Gradually raise the heat until ammonia cannot be smelled, then sinter for one hour with fairly full flame, especially at the last. During sintering put small beaker of water on crucible cover. Transfer sintered cake to 250 cc. casserole, add 100 cc. water and boil, also fill crucible with water and heat for a while. Decant through filter into 1,250 cc. casserole. Repeat boiling and decanting through filter using about 50 cc. of water each time until only traces of chloride are present, then transfer residue to filter and wash twice with hot water. This cannot be done in less than three hours as a rule. Add 20 cc. of a saturated solution of ammonium carbonate and evaporate to a volume of 25 to 100 cc. Add 10 cc. ammonium carbonate. Filter into 250 cc. cassarole, washing free from chlorides. Evaporate to 10 cc. Add 2 drops ammonia and excess ammonium oxalate (a few drops) and let set over night. Filter through 5½ cm. filter into 75 cc. platinum dish. Wash moderately with an 0.1 percent solution of ammonium oxalate. Evaporate to dryness finishing in oven at 110° C. Ignite after drying at 110° C. until ammonium salts are volatilized. Dissolve in a little hot water. Filter into small porcelain dish and transfer back to 75 cc. platinum dish which has been weighed. Evaporate to dryness, dry at 110° C. Ignite to dull red, cool in desiccator and weigh as NaCl plus KCl. Add 20 cc. hot water, a drop hydrochloric acid and 1/2 cc. perchloric acid, specific gravity 1.54, 60 percent. Evaporate to dryness at a temperature not over 350° C. Cool, add 20 cc. absolute ethyl alcohol containing 0.2 percent perchloric acid. Break up residue, let stand 15 minutes, filter through tared Gooch crucible and wash six times with the above alcohol that has been saturated with potassium perchlorate. Drain thoroughly and dry 1 hour at 120° C. Cool and weigh as potassium perchlorate ($KClO_4$).

Weight of $KClO_4$ x Factor = KCl
Weight of $KClO_4$ x Factor = K_2O
Total Chlorides minus KCl = NaCl
NaCl x Factor = Na_2O

Iron Oxide (Fe_2O_3)—to five gm. sample in a platinum or other resistant dish add 20 cc. of 1/3 sulfuric acid. Add about 40 cc. hydrofluoric acid and stir vigorously with platinum wire. Evaporate to expel hydrofluroic acid (HF) and silicon tetrafluoride (SiF_4) on water bath. Fume sulfuric acid by keeping in motion over low flame. Cool, add water and 5 cc. concentrated hydrochloric acid (HCl). Heat to boiling and reduce with stannous chloride ($SnCl_2$), avoiding excess. Add 10 cc. of a saturated solution of mercuric chloride and after three minutes pour into at least 500 cc. cold water. Add 20 cc. titrating solution and titrate with potassium permanganate solution.

Note: Stir while evaporating hydrofluoric acid and silicon fluoride and correct results by a blank run on reagents.

$SnCl_2$ Solution—Dissolve 50 gms. of stannous chloride in 100 cc. hydrochloric acid. Dilute to 1,000 cc. with water.

Titrating solution—Dissolve 67 gms. manganese sulfate ($4H_2O$) in water. Add 138 cc. phosphoric acid (H_3PO_4) and 130 cc. concentrated sulfuric acid. Dilute to 1 liter.

$KMnO_4$ Standard—1.05 gms. per liter. Dissolve 0.1 gm. Bureau of Standards sodium oxalate in 500 cc. hot water. Add 15 cc. manganese sulfate ($Mn SO_4$) titrating solution. Titrate drop by drop to pink.

Free Iron—Cover 10 gms. of sample with concentrated hydrochloric acid (HCl). Add 2 cc. stannous chloride ($SnCl_2$). Cover and heat one hour. Reduce with stannous chloride ($SnCl_2$). (If colorless oxidize with permanganate then reduce.) Cool. Add 10 cc. mercuric chloride. Dilute, add 20 cc. titrating solution and titrate with permanganate standard.

Loss on Ignition—Heat 5 gm. sample 1/2 hour in tared crucible with full force of burner. Cool and weigh. Use this sample for Fe_2O_3 determination.

INSTITUTE ESTABLISHES CREDIT BUREAU

A meeting of the Feldspar Grinders Institute held in Washington on November 22 leading up to the January meeting was addressed by Henry P. Fowler, assistant manager of the Research Department of the United States Chamber of Commerce, who described in detail the things to be accomplished by a trade practice conference. G. W. Wray of the Bureau of Standards, Department of Commerce, told what the Bureau has accomplished on commercial standards since 1923. H. H. Steidle of the Bureau also spoke of the activities of his organization on standardization problems.

One of the agencies of the Institute intended to effect certain improvements is the recent inauguration of a general exchange of credit information. The Credit Committee has set up a system for the handling of credit matters through the office of the Institute that became effective January 1, 1930.

DATA ON ULTRAVIOLET SOLAR RADIATION AND THE SOLORIZATION OF WINDOW MATERIALS, by W. W. Coblentz, physicist, and R. Stair, junior physicist, Bureau of Standards, Washington, D. C. Reprinted from the *Journal of Research*. A 70-page publication treating of the transparency of window materials. For sale by the Superintendent of Documents, Washington, D. C. Price $.15.

THE AMERICAN STANDARDS ASSOCIATION recently approved a national standard for radio tube bases. The Institute of Radio Engineers and the American Institute of Electrical Engineers cooperated in accomplishing the standardization work. This is the first authoritative national standard for radio equipment.

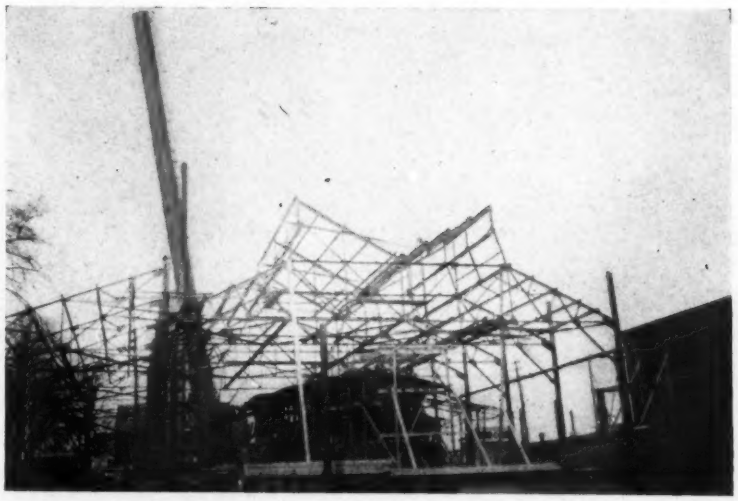
Hoisting a 16-Ton 125-Foot Tank Stack with an 85-Foot Gin Pole

LOOKING WEST—A GOOD START.

UP SHE GOES!

THESE views taken a few weeks ago picture the scene at the Central Falls plant of the Rhode Island Division of the Corning Glass Works when a great 125-foot stack weighing 16 tons was hoisted in one piece from the ground and swung into its permanent vertical position by means of a gin pole 85 feet high. The function of the stack is to remove waste gases from and provide proper draft for the melting tank which will be housed in the steel structure, the framework of which is shown to be practically completed.

(Photos by courtesy H. F. Eiler)



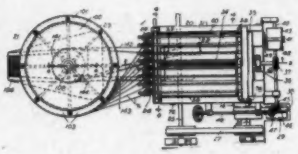
LOOKING NORTH—AH-H-H! THE CRITICAL MOMENT

Recent Patents

NEW INVENTIONS DESIGNED TO IMPROVE GLASS AND THE MEANS OF PRODUCING IT

Complete copies of U. S. Patent Specifications may be obtained from the Commissioner of Patents, Washington, D. C., Price 10c each

METHOD AND APPARATUS FOR SPINNING GLASS. U. S. 1,738,217 Dec. 3, 1929. Edmund Wellech, Corning, N. Y., assignor to Corning Glass Works, Corning, N. Y. Filed 4/18/24 and in Austria 5/4/23. An object is to provide a method of producing long glass wool threads, and for winding up these threads in such a manner that they may be unwound as a continuous thread, and further to provide means for spinning, winding and unwinding a group of threads simultaneously as a glass yarn.



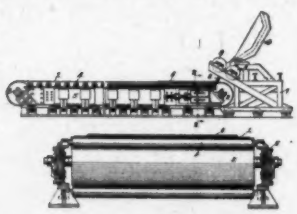
Among the difficulties which it has heretofore been impossible to overcome in the glass spinning operation have been the inability to find the end of the glass thread after it was wound onto a drum or wheel, and the inability to prevent adhesion between the threads of a given layer, or between successive layers. As a result of this, the spun glass could only be removed from the drum by cutting it into a series of threads whose length did not exceed that of the circumference of the drum.

The use of spun glass has therefore been largely limited to cases in which a mass of glass fibers were satisfactory, as glass wool for thermal insulation, and where short lengths of glass threads could be utilized, as in the manufacture of Christmas tree ornaments and novelties.

In the present invention there is provided a means for overcoming these difficulties, said means consisting in winding the glass thread in a helix to form each layer, and in winding adjacent layers in different directions so that the fibers of the threads of the adjacent layers do not tend to unite.

By producing spun glass in long continuous threads, which can be unwound as desired, it is made available for a whole new field of useful purposes. Instances of this are the weaving of the glass thread into textiles, filter cloth, moving picture screens, and storage battery plates, glass thread for insulating electric wires, brushes for industrial uses, and glass rope for packing.

GLASSWARE-FORMING MEANS. U. S. 1,739,452. Dec. 10, 1929. Ival G. Fowler, Toledo, O., assignor to The Edward Ford Plate Glass Company, Rossford, O. Original application filed 9/23/26. Divided and this application filed 9/24/28. In combination, means for forming molten glass into sheet form and permitting an advance of the sheet as it is formed, and conveying means including conveying belt of woven wire fabric for receiving the sheet directly in contact therewith as it leaves the forming means and while in soft unset condition. said wire fabric being of fine open mesh construction to minimize marring of the soft unset sheet in contact therewith and to permit uniform cooling of the sheet.



PROCESSES AND APPARATUS FOR MAKING COMPOSITE GLASS. U. S. 1,732,022. Oct. 15, 1929. William O. Lytle, New Kensington, Pa., assignor to Pittsburgh Plate Glass Company, Pittsburgh, Pa. Filed 2/6/28. In combination in apparatus for use in securing together a set of sheets of similar size arranged in a pile with their edges flush to form a plate of composite glass, a shielding strip of relatively hard material extending around the edges of the sheets and lying over the joinder between the sheets, a strip of flexible material of general u-shape fitting over the shielding strip with its edges in engagement with the outer faces of the outer sheets, a pressure chamber surrounding the sheet as thus assembled, and means for successively applying suction and fluid pressure to said chamber.

METHOD OF AND APPARATUS FOR ANNEALING GLASSWARE. U. S. 1,735,353. Nov. 12, 1929. Vergil Mulholland, West Hartford, Conn., assignor to Hartford-Empire Company, Hartford, Conn. Filed 9/10/23. Object is to create a proper environment through which the glassware may be moved continuously on a conveyor and be subjected as nearly as possible to the ideal cooling conditions; to provide a lehr and method of operation capable of annealing glassware as far as possible without fuel.

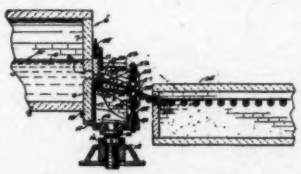
The ware is passed through a lehr tunnel whose walls are constructed so that the various portions of the tunnel may be quickly raised to the desired temperature with a minimum amount of heat. In this and in other ways the tunnel is adapted to maintain a proper environment about the ware as it is passed therethrough. The temperature of this environment and of the ware as it passes through the tunnel is controlled in part by a counter-current of cooling air. The thermal properties of the tunnel, especially at its hot end, are made more efficient by making interior surfaces of that end of the tunnel of bright reflecting material.

The ware is carried through the tunnel by an endless conveyor. This conveyor passes through the bottom of the lehr tunnel close to the ware, whereby the return strand when it again takes on the hot ware, is reheated to nearly the temperature of that ware. The tunnel is made adjustable in cross-section to suit the size of the ware being made. The lehr is made of separable unit sections placed end to end to form the tunnel, and provisions are made for taking care of the expansion and contraction of the parts most subjected to heat.

SHEET-GLASS-SURFACING APPARATUS. U. S. 1,735,565. Nov. 12, 1929. John L. Drake, Toledo, O., assignor to Libbey-Owens Glass Company, Toledo, O. Filed 1/5/27. The invention is to provide in sheet glass surfacing apparatus, a plurality of polishing members, means for raising and lowering said members relative to the glass, means for feeding a polishing material onto the glass, and means for supporting the glass and carrying the polishing material beneath the polishing members while said members are in their raised positions.

Provide in sheet glass surfacing apparatus a plurality of groups of polishing members, means for feeding a polishing material to each group, means for raising and lowering the members of each group relative to the glass, and means for supporting the glass and carrying the polishing material beneath the members of each group while said members are in their raised positions.

SHEET-GLASS-FORMING APPARATUS. U. S. 1.735,595. Nov. 12, 1929. James C. Blair, Toledo, O., assignor to Libbey-Owens Glass Company, Toledo, O. Filed 5/15/26. An invention to provide a process and apparatus for producing sheet glass wherein an adjustable slab is suitably associated with a glass supplying receptacle whereby a stream of glass may flow down said slab, preferably under the head pressure of the molten supply, the apparatus including rolls associated with the slab to reduce the stream to sheet form of predetermined dimensions.

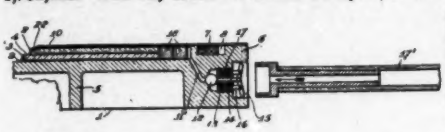


Said slab includes means for adjusting the angularity of the slab to control the speed of flow down the same.

APPARATUS FOR FEEDING MOLTEN GLASS. U. S. 1,735,837. Nov. 12, 1929. Karl E. Peiler, West Hartford, Conn., assignor to Hartford-Empire Company, Hartford, Conn. Filed 6/24/25. Invention of apparatus for feeding molten glass from a container to

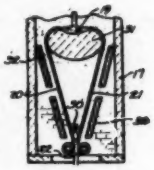
form mold charges. The operation of the stirring implement is controlled independently of the other feeder-operating mechanisms, and the stirring implement is supported and rotated by means of an improved structure which facilitates its operation, provides protection against heat, and provides for convenient removal and replacement of parts that are subject to wear.

PROCESS AND APPARATUS FOR MAKING COMPOSITE GLASS. U. S. 1,732,023. Oct. 15, 1929. William O. Lytle, New Kensington, Pa., assignor to Pittsburgh Plate Glass Company, Pittsburgh, Pa. Filed 2/6/28.

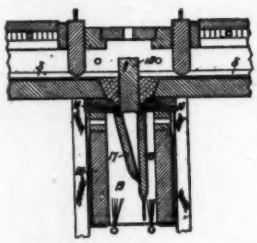


In apparatus for securing together a set of sheets, a tray having a flat rigid bottom adapted to receive the set of sheets, a removable flexible sheet closing the top of the tray and making sealing contact with the edges thereof, means for exhausting the air from the interior of the tray, to bring the edges of said sheet into sealing contact with the edges of the tray and to cause the pressure of the atmosphere on the flexible sheet to clamp the series of sheets tightly against the flat rigid bottom of the tray, and a pressure chamber for receiving the tray, with means for applying fluid pressure thereto on all sides of said tray and its closure.

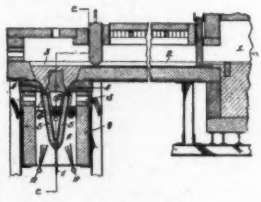
METHOD FOR PRODUCING SHEET GLASS. U. S. 1,731,260. Oct. 15, 1929. William E. Nobbe, Toledo, O., assignor to Libbey-Owens Glass Company, Toledo, O. Filed 2/15/28. The method of forming sheet glass, which consists in creating two downwardly flowing streams of molten glass, maintaining the body portions of said streams free from contact with mechanical means during the major portion of their travel, uniting said streams and continuing movement thereof in the form of a single sheet.



METHOD AND APPARATUS FOR FORMING GLASSWARE. U. S. 1,734,965. Nov. 12, 1929. Edward Danner, Toledo, O. Filed 12/5/21. An invention for the production in a rapid, efficient and inexpensive manner of glassware, particularly sheet glass of an obscure nature, or having different shades or colors, by flowing two or more films or streams of molten glass, a portion at least of which are of different colors or characteristics from the others, from sources of supply, and uniting the several films or streams into a single stream or sheet, the sources of supply being different, at least for the films having different colors or characteristics.



METHOD AND APPARATUS FOR MANUFACTURING CONTINUOUS GLASSWARE. U. S. 1,734,964. Nov. 12, 1929. Edward Danner, Toledo, O. Filed 11/17/21. An invention to increase the speed of tempering, flowing and forming continuous glassware, particularly sheet glass, by flowing three or more films of glass from a source or sources of supply, separately tempering the films, and then integrally uniting them into a single sheet.



A further object of the invention is the production of glassware, particularly sheet glass, of different shades or colors, in a rapid, efficient and inexpensive manner by flowing a plurality of films of glass, a portion at least of which are of different color or characteristics from the others, from sources of supply and uniting the several films into a single film, the sources of supply being different, at least for the films having different colors or characteristics.

GLASS FORMING APPARATUS. U. S. 1,737,221. Nov. 26, 1929. Albert N. Cramer, Toledo, O., assignor to Owens-Illinois Glass Company, Toledo, O. Filed 9/2/26. An improved form of steadying device or holder by which lateral movement of the ware upon the finish mold bottom plate prior to tilting of the latter, is said to be entirely eliminated.

GLASS FEEDER. U. S. 1,737,220. Nov. 26, 1929. Albert N. Cramer, Toledo, O., assignor to Owens-Illinois Glass Company, Toledo, O. Filed 9/8/23.

GLASS-BLOWING MACHINE. U. S. 1,737,524. Nov. 26, 1929. Leonard D. Soubier, Toledo, O., assignor to Owens-Illinois Glass Company, Toledo, O. Filed 12/29/22. Designed to overcome the tendency for the blank of plastic glass in an automatic bottle machine to become distorted and unduly stretched just below the neck mold when inverting the bare blank.

GLASS FEEDER. U. S. 1,737,525. Nov. 26, 1929. Leonard D. Soubier, Toledo, O., assignor to Owens-Illinois Glass Company, Toledo, O. Filed 10/26/27. An object of the invention is to provide in a feeder of the type indicated, an implement rotating in one direction for stirring, and a cooperating implement rotating in the reverse direction.

MOLD FOR FORMING GLASS VESSELS. U. S. 1,738,964. Dec. 10, 1929. Harold J. Raynes and Frank J. Denning, San Francisco, Cal., assignors to Illinois-Pacific Glass Corporation, San Francisco, Cal. Filed 8/16/26. The object is to eliminate the seam on the rim of glass vessel caused by hinged molds and this is accomplished by providing a continuous and integral ring to close the space between the plunger and the neck mold and form a smooth, even seat for the rim of the vessel.

APPARATUS FOR FEEDING MOLTEN GLASS. U. S. 1,738,923. Dec. 10, 1929. Karl E. Peiler, West Hartford, Conn., assignor to Hartford-Empire Company, Hartford, Conn. Original application filed 1/27/23. Divided and this application filed 2/17/27.

APPARATUS FOR GRINDING, SMOOTHING, AND POLISHING PLATES OF GLASS, MARBLE, OR OTHER SIMILAR MATERIALS. U. S. 1,738,730. Dec. 10, 1929. Eugene Rowart, Auvelais, Belgium. Filed 11/4/27, and in Belgium 4/4/27. Rubbing members connected together to form an endless chain, rubbing plates carried by the rubbing members, a monorail forming an elongated ring above the rubbing members, wheels frictionally engaging the monorail and connected to the rubbing members, and means for rotating said wheels to propel the rubbing members.

GLASS CUTTING. U. S. 1,738,228. Dec. 3, 1929. Furman N. Campbell, New Haven and Jules Myatt, East Haven, Conn., assignors to Bessie L. Gregg, New Haven, Conn. Filed 6/24/20. Relates to processes and apparatus for severing and trimming glass such as laminated glass. A process and suitable apparatus is described for use in the cracking, splitting or cutting one of the layers of glass along the desired line. Subsequently the preferred methods for cuting or cracking the other layer of glass and for dividing the layer of viscose is described.

GLASS CUTTING. U. S. 1,738,229. Dec. 3, 1929. Furman N. Campbell, New Haven and Jules Myatt of East Haven, Conn., assignors to Bessie L. Gregg, Forest Hill Garden, N. Y. Filed 12/10/29. Particularly adapted for cutting or severing laminated glass.

MACHINE FOR THE MANUFACTURE OF GLASS ARTICLES. U. S. 1,739,140. Dec. 10, 1929. Robert Frederick Hall, Wythall, near Birmingham, England. Filed 9/17/27 and in Great Britain 11/18/26. The object is to provide simple, compact and efficient mechanism for raising a mold, such mechanism being actuated by means of a cam, which, in the case of a rotary framework carrying the mechanisms may be mounted on a central column or other appropriate portion of the machine.

APPARATUS FOR PRODUCING MOLD CHARGES OF MOLTEN GLASS. U. S. 1,738,499. Dec. 3, 1929. William J. Miller, Swissvale, Pa., assignor to Hartford-Empire Company, Hartford, Conn. Filed 5/27/26. Comprises a new and improved mechanically operated feeder for supplying mold charges to fabricating machines.

Appeal Filed in Benedictus Patent Infringement Case

Following the decision of Judge F. P. Schoonmaker of the Federal District Court at Pittsburgh, Pa., on November 15 in the laminated glass patent infringement suit of the Triplex Safety Glass Company of North America against Pittsburgh Safety Glass Company (now Duplate Corporation) in favor of the plaintiff, the court early in December, on the filing of an appeal by the defendant, gave permission to carry the case to the United States Circuit Court of Appeals at Philadelphia. An order suspending the injunction granted against the Pittsburgh Safety Glass Company was issued upon the posting of a $50,000 bond. The surety is the Maryland Casualty Company, of Baltimore, Md.

The case involves U. S. Patent No. 1,182,739 and infringement is alleged of claim 12.

Prior to the filing of the appeal, a decree was entered on the Federal dockets, adjudging that letters patent 1,182,739 were good and valid and the property of the Triplex Safety Glass Company, and that the Duplate Corporation had infringed the patent and was enjoined from further infringement. The decree also set forth that the Triplex company is entitled to recover costs, damages, etc., and the case was ordered referred to G. Dixon Shrum, as special master, for an accounting.

There are ten reasons listed in the assignment of errors filed in connection with the appeal of the case. It is probable that the litigation will be of considerable duration as it is possible that the case will eventually reach the United States Supreme Court should the United States Circuit Court of Appeals uphold the opinion of Judge Schoonmaker.

The reasons given in the assignment of errors are as follows:

1. The District Court erred in holding Claim 12 of the patent is to be construed broadly, and in not holding that in view of the prior art Claim 12 can lawfully cover only the product of the process described in the specification of the patent, involving the subjection of the film of gelatin binder to the dehyrating action of alcohol or other substance having the same effect.

2. The District Court having found that in the prior art the strengthening of glass by inserting a sheet of celluloid between the sheets of glass was known, and the use of balsam for causing the sheet of glass and celluloid to adhere together was disclosed in the prior patent of Wood, and having further found that "the fact that gelatin might be used as an adhesive was also known to the prior art," the court erred in so construing Claim 12 of the patent as to in effect forbid the public use of gelatin for that purpose effectively, and in the state that any one skilled in the art would naturally use it for that purpose.

3. In view of its findings of fact last above quoted, the district court erred in making the further finding, that "Benedictus was the first to bring to the art the use of gelatinous cement which would provide an unclouded glass."

4. Since in the description portion of the specification of the patent in suit there is no reference to any product except that of the process therein described, nor is there any expression of an intention to cover the product of any other method of manufacture, the district court erred in not holding that Claim 12 of the patent must be construed as covering only the product of the process so described.

5. The district court erred in so construing Claim 12 of the patent in suit as, in substance and effect, to deny to the public the protection given by that provision of the law which requires of the patentee that "he shall particularly point out and distinctly claim the part, improvement or combination which he claims as his invention or discovery (R. S. Section 4888).

6. The district court erred in holding that in the defendant's product, wherein at the time of assembling the glass with the interposed sheet of celluloid, the gelatin coating upon each glass sheet is only sufficiently dry to be "practically dry to sight and to touch," the said gelatin coatings are "substantially free from contained moisture" as required by Claim 12 of the patent in suit.

7. The district court erred in holding that in the defendant's product wherein at the time of such assembling the moisture in the said gelatin coatings has been only "sufficiently extracted so as to cause the sheets of celluloid and glass to adhere to one another with no impairment of transparency," the said gelatin coatings are "substantially free from contained moisture" as required by Claim 12 of the patent in suit.

8. The district court erred in finding upon the evidence, that in the defendant's product the moisture content of the cementing gelatin is practically the same as in the plaintiff's product manufactured under the patent in suit, and in not finding that in the defendant's product the moisture content of the cementing gelatin is substantially greater, and that the defendant's product is substantially different from that defined in Claim 12 of the patent in suit.

9. The district court erred in holding that the defendant has infringed Claim 12 of the patent in suit, and in not holding that the defendant has not infringed said patent.

10. The district court erred in granting to the plaintiff the decree herein appealed from, and in not having made a decree dismissing the bill of complaint.

A petition was also presented to the court for the changing of the name of the Pittsburgh Safety Glass Company, to the "Duplate Corporation." Judge Schoonmaker signed an order authorizing the change.

The appeal was taken by Marshall A. Christy, of Pittsburgh, counsel for the Duplate Corporation.

Vapor Bath Process for Degreasing Glass

A new vapor bath process for the degreasing of metals, glass and other impervious materials, has been developed by the Carrier Engineering Corporation of Newark, N. J. and will shortly be made commercially available.

In this process a solvent known by the Carrier trade name of Cecolene is boiled and vaporized. In the standard tank form of the apparatus the vapor rises to the level of water-cooled condenser coils around the sides near the top of the tank, is condensed and precipitated to the bottom of the tank. Since the vapor is more than three times as dense as air there is no tendency to overflow or escape.

The objects to be degreased are suspended in the vapor, which condenses on their cold surfaces at once and runs off profusely, carrying with it all grease. The object are kept in the vapor until they heat up to its temperature, in from 1½ to 3 minutes, the time depending upon the gauge or weight of the metal or other material. They are then removed in a warm, perfectly dry and clean state, any foreign matter remaining being in the form of dust easily removable.

The objects being degreased do not come into contact with grease previously removed from other material, since the solvent vaporizes at a temperature much lower than the grease, which remains in the liquid below. Economy results from the fact that the chlorinated solvent can be used over and over, the vapor never becoming "dirty".

The Vapor Degreaser is to be made in standard dip tank units and in special designs adaptable to any size or style of continuous conveyor in line assemblies, and to steam, gas or electric heating. The makers are prepared to make surveys of any special degreasing problems.

Cecolene is a blanket term for a group of chlorinated solvents adaptable to various uses and materials, and the Carrier research is prepared to supply any needed variation of the formula for a special case.

Obvious uses for this device are in the degreasing of metal stampings, die castings, bolts and nuts, metal furniture, metal lacquerware, hardware of many kinds, motor parts, kitchenware, dishes, leather belts, brakebands, articles of glass, Bakelite, celluloid and many other products requiring a cleaning of grease before finishing or packing for distribution.

The Vapor Degreaser was developed in the Carrier experimental laboratories at the Newark plant. It is expected that a separate company will make and market it. The first machine perfected was exhibited at the Power Show. The apparatus is neither complicated nor costly and the Cecolene fluid can be used over and over. By the insertion of diversion condenser plates, the tank can be used for the rectification of Cecolene and other cleaning fluids, also.

Cloth and porous fabrics cannot be degreased in the vapor, but anything can that is impervious enough to permit the condensed fluid to run back into the reservoir.

The Glass Industries of Eastern Europe

Bulgaria, Greece, Turkey and Yugoslavia

By J. E. BARABAS
Special Correspondent, Roumania

The glass production of these countries is a very small one, as they practically do not have any industries of importance at all.

To begin with Bulgaria—the small country with a very industrious population—there is a single glass plant in Gebedje, equipped with one continuous tank and one pot furnace. The production consists of bottles which—in want of a suitable staff of experienced workmen—will mostly be made by half-automatic devices. They also are making water glass. The capacity of the factory is very small and they produce but 20% of the whole demand, though it must be said at the same time that the necessities of the whole Bulgarian market is of no practical importance at all. The country has suffered great losses in the world war and is now very poor. Nearly 80% of the requirements will be imported from Hungary, Czechoslovakia and Roumania. It is said that a new window glass factory will be erected in the neighborhood of Sofia, the capital of the Bulgarian state. Also we hear that the glass plant of Gebedje is going to reorganize its whole equipment, intending to enlarge capacity, to improve quality and to produce hereafter the whole scale of tableware, restaurant equipment and all kinds of bottles necessitated by the inland customers.

The whole Bulgarian demand in glass may be estimated at not more than 35 million Levas per year, equal to about 225,000 dollars.

As to Greece, we are in the position to report the existence of a glass industry which, though small, is yet well equipped and displaying a many-sided activity. There are in Greece two glass plants. The Verrerie "Hermes," property of Mr. Ch. D. Argyropoulos, is the oldest glass factory of Greece. It was founded in 1870 and is situated in Piraeus, the seaport of Athens. The production consists of bottles, jars, domestic and press glass ware, but the quantity put on the market is small. They have no continuous tank at all, only two pot furnaces. The second glass plant that was founded in 1912 is the property of the Société Hellénique Anonyme de Produits et de Engrai Chimiques, Athens. This factory is favorably situated in Piraeus and is a very well equipped, up-to-date plant, which has been reorganized and enlarged lately. Bottles, jars, domestic and press and illuminating blown glass ware will be equally produced, but what is most important, they lately have taken up the manufacture of window glass which until that period has been bought entirely from abroad. The Société Hellénique is employing about 700 workmen and is running 3 continuous tanks and one pot furnace. Flat glass will be made by one Fourcault machine, while the bottles will partly be manufactured by 8 "Roirant" suction full-automatic machines. This machinery proves the tendency towards rationalization and good results have not failed to come. Though Greece cannot exist without importing considerable quantities of glass, the inland production being unable to satisfy the demand, yet the new production of the Soc. Hellénique has effected a reduction of 40% of the imports. This was the result in 1928, against the figures of 1927, while a further expansion of the home-made glass ware is to be expected in 1929. It is interesting to note that the reduction on the import has mostly affected the interests of the Belgian, French and Bohemian plants, whilst the German and British glass industry have succeeded even in increasing their exports to Greece.

Turkey has no glass industry at all. There have been two small plants in Constantinople but they have not been worked since many years. Consequently, any glass used in Turkey for any purpose will be imported. Demand is increasing, especially in window glass, owing to government building schemes. A considerable customer for bottles is the State Monopoly of alcohol. Turkey imports her glass articles from Czechoslovakia, Germany, Belgia, France, Hungary and Roumania.

Yugoslavia

Yugoslavia is one of the state-structures that on the south-east borders of Europe, before the end of the world war, belonged to the group of the small Balkan states. The former Servia emerged from the world war three times as big as it had been and the today's Yugoslavia is a flourishing, important Kingdom, covering 249,000 square kilometers, with a population of 12 millions. The new territories that have been added to it: the very mountainous kingdom of Montenegro, further very important, rich and highly cultured provinces of the former Austro-Hungarian Monarchy, such as: Croatia, Bosnia-Herzegovina, Dalmatia, Banat, Slovenia.

The former Servia had so to speak no industry at all, but the dismembered Austria and Hungary brought well-equipped plants when their provinces passed to the conquerors.

While until the peace treaty Servia had but a single glass plant, that of Paracin, the newly attached Slovenia possessed quite a number of plants as that of Hrastnik, Daruvar, Rogatec, Rogaska, Slatina and Zagorje. Of all this the most important is Hrastnik. The Slovenian glass works are all controlled by the Vereinigte Glasfabriken A. G., Zagreb (United Glass Plants Co., Ltd.) The single competitive plant was therefore that of Paracin, property of the Serb state, but at the beginning of this year the Slovenian group succeeded in coming to an agreement with the government. They bought up Paracin, so that at present the whole glass industry of Yugoslavia is directed by one single hand.

The plants of the United Glass Plants Co., Ltd. (with central offices in Zagreb) are manufacturing all kinds of bottles, tableware, pressed ware and lighting articles in every color and fairly good quality. They even have an export to Austria. The Daruvar plant is the individual plant that is destined for the manufacture of window glass, but it was compelled to suspend working owing to the very keen Bohemian and German competition.

The factories are well-equipped and there is a sound tendency for the gradual application of modern devices. The Hrastnik plant lately bought several "Roirant" full-automatic bottle making machines.

The production— about 20,000 tons per year—does not cover the whole inland demand, so that until lately considerable quantities have been imported into Yugoslavia not only in window glass and fine cut ware, but even in bottles. Roumania and chiefly the Bohemian plants, the latter by the medium of the Union Bank of Prague, appeared with their bottles on the Yugoslav market. The proprietors of the United Glass Plants Co., Ltd., Zagreb, the so-called Abel-concern, having done away with all inland competition, is now desirous to eliminate also foreign contest. It has begun negotiations with the Union Bank of Prague, that is to say the European Bottle Cartel, to this end.

Prices of bottles and all glass articles are maintained very high. I quote only the factory prices for simple green mineral water bottles, which amounts to $5.40 for 100 pieces, carriage paid, while the same bottle costs in Germany, or Bohemia about $3.50 only. There is a big margin between the foreign and inland prices, yet such high quotations may be upheld because the Yugoslav glass plants enjoy a tremendous tariff protection. The custom duty for the above said mineral water bottle is not less than $4.80 per 100 kg. This high protection has certainly no equal in any European state.

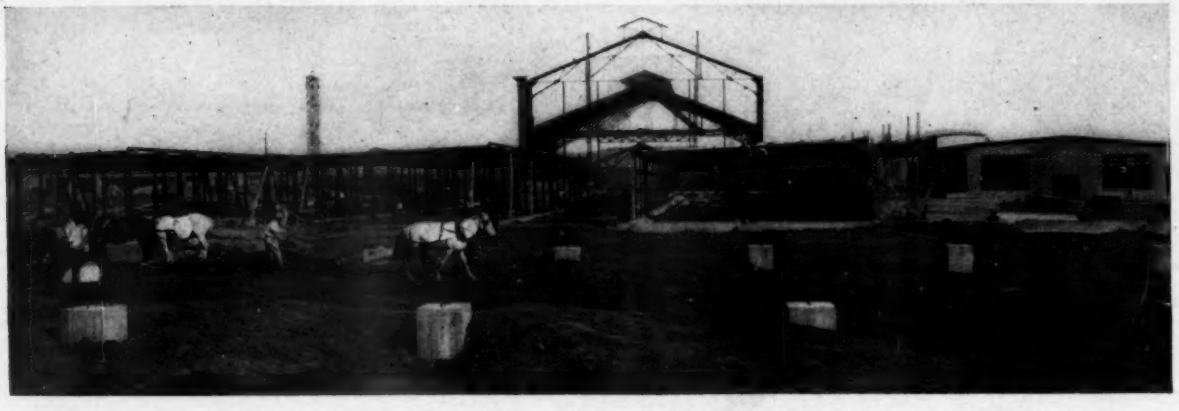
In this connection it will be interesting to mention that since the United States are tending towards a highly protectional tariff policy, the European factories have won a very efficient argument against their Government inclined to reduce protection. The new tariff policy of the United States is the general topic in all glass circles of Europe.

* * *

Germany, along with Belgium and the United States, is doing a good business in Cuba also. Here it is most of all richly decorated and channeled glassware for household use, be it glasses, bottles, baskets, plates, bowls, vases, cups, vessels, etc. In South Africa again hollow glassware and models for medical as well as scientific use, also glass apparatus, form a splendid selling market for German and American glass products.

Oklahoma Window Glass Plant Takes Shape

The two million dollar window glass manufacturing plant under construction at Henryetta, Okla., by the Pittsburgh Plate Glass Company will be in operation by March 15, 1930, according to present indications and judging from the progress made since the building operations were begun.



FOUNDATIONS IN FOREGROUND ARE FOR THE WAREHOUSE 300 x 200 FEET. BUILDINGS BEING ERECTED IN BACKGROUND ARE THE FOUR CUTTING HOUSES, EACH 360 x 40 FEET. THE TALL STEEL STRUCTURE IS PART OF ONE OF THE TANK BUILDINGS. THE STOREHOUSE BUILDING CAN BE SEEN ON THE RIGHT OF THE PICTURE.

In the clay building, the only structure completed up to this time, refractory products are being made and seasoned so as to be ready when production starts.

Two construction companies, the Rust Engineering Company of Pittsburgh, and the W. S. Bellows Construction Company of Oklahoma City, are engaged in erecting the four cutting rooms, two furnace buildings, warehouse, box shop, box shop storage buildings, store room, shop and maintenance building, clay building, batch bins and mix house, office, timekeeper's office and hay sheds. There are sixteen main buildings comprising the plant.

The steel for the plant is being furnished under a $250,000 contract by the Muskogee Iron Works, Muskogee, Okla. However, the Carnegie Steel Company of Pittsburgh, Pa., is furnishing some of the steel going into the structures. Other firms furnishing materials are: Brick, Kusa Brick & Tile Company, Henryetta, Okla.; sand, gravel and cement, J. B. Croom Lumber Company, Henryetta; cast iron pipe for storm and sanitary sewers, Atlas Supply Company, Muskogee, Okla.; electric motors, Fairbanks-Morse Company, Chicago, Ill.; electrical supplies, General Electric Company, Schenectady, N. Y.; silica brick, Harbison-Walker, Pittsburgh; fire brick and clay, Laclede-Christy, St. Louis, Mo. Last year after a thorough investigation by experts, Henryetta was selected for the location of this plant over seventeen competing cities in five states, because of its advantages as a glass factory location.

A site comprising forty-five acres in the city limits was given the company by the Henryetta Chamber of Commerce. The plant, when completed, and running at full capacity, will it is said employ 460 people with an annual payroll of $800,000 and produce 950,000 boxes of window glass annually. J. N. Hodgson will be superintendent of the plant.

(*Continued from page* 10)

his friends think he can perform—that of creating a special classification in membership to which a small and selected group might be elected, the basis of whose selection would be *outstanding achievement,* chiefly in the field of ceramic technology, but including also real achievement of a practical sort in the ceramic arts. In the earlier years of the Society's life, election to active membership carried this significance, and for that reason the number of active members was small in proportion to the total membership.

Since considerable changes in the constitution of the Society were made some years ago, active membership has ceased to carry the meaning of definite ceramic achievement, and has become a mere matter of paying dues. General Orton said he fully believed and knows that many others also feel that the Society has lost something of value from this fact, and that it should rectify the situation.

"If I am elected I should expect to devote my best energies to bring about action to accomplish this general purpose. The details of the methods and procedure, I should, of course, not attempt to indicate at this time."

He pointed out that there are two schools of thought existing. One may be summarized in the idea that the Society is a scientific organization which should represent the technical aspects of ceramic science and technology, a sufficient field for it to occupy. The other group thinks the Society must broaden out and make itself felt more quickly and definitely in the direction of making ceramic knowledge more available to the various ceramic industries—to the commercial side of the business.

As between these two schools of thought the Society will be compelled to make a choice. Some promotion work and researches are being done for the benefit of such organizations. The question is "whether more money and greater activity should be put into this department of the Society's work in the future, or less. My personal belief is that the Society should not stand on the fence in this matter, and that it should, so far as the limitation of its budget permits, assist in interpreting its ceramic researches so as to make them more useful to sales organizations, and in promoting the business side of the ceramic industries."

In other words the decision between the purely scientific work, *for itself,* and scientific and technical work *as a means to industrial expansion,* is really the question at issue.

General Orton emphasized the fact that he wants every member to know where he stands on these two outstanding questions relating to the Society's future policy.

Precision Devices for Glass Manufacturers

Toledo Precision Devices, Inc., a recently organized subsidiary of the Toledo Scale Company, Toledo, O., are producing more than fifty different precision instruments and devices, a number of which apply directly to the manufacture of glass. Their use varies from the gauging of glass tubing to the determination of final glass area by means of precision weighing.

Besides the distribution of these products, an investigation department is maintained where specific problems of glass manufacturers are worked out upon submission. The factory and headquarters of the new company are located in Toledo, O.

New Glass Magnifies 2,250 Times

Capable of magnifying an object to 2,250 times its natural size and of shifting its magnification from first to fourth power or vice versa, what is believed to be the world's most powerful research microscope has just been completed at the Bausch & Lomb Company at Rochester, N. Y. The instrument has brought queries from all parts of the world, although not yet on the market.

The Glass World and What It Is Doing

News of the Industry

How to Sell More Glass Tea Sets

The American tea industry has just announced a national campaign intended to increase the popularity of tea as a beverage and to encourage tea drinking as part of the average citizen's daily routine. Manufacturers of chinaware tea service sets will doubtless capitalize this opportunity for approaching the same readers to whom the tea propaganda will be directed, at a time when they are likely to be in a receptive mood. Such publicity would undoubtedly stimulate sales of tea sets, but why not glass tea sets?

Here is an opportunity for the manufacturers of glass tea pots, cups, saucers, sugar bowls, plates, etc., as well as tumblers for iced tea, goblets for water, etc., glass lamps, table tops, flower pots and vases, to increase their sales. Let them get together and put before the same public a series of properly planned and executed advertisements and back it up by public demonstrations of the surpassing attractiveness of a tea table set with brilliant, scintillating glassware instead of articles made of dull-looking, less effective, untransparent materials.

The subject has such interesting possibilities for publicity that a campaign developed along this line might even develop a humorous side, as a good advertising man might conceivably make the glass appear so attractive to the housewives who read his descriptions that they would take to tea drinking even if they do not like tea, just as an excuse to their husbands for buying a new set of tableware!

Big Addition to Corning Plant

The Corning Glass Works, Corning, N. Y., has awarded a contract for the construction of a new glass tube manufacturing plant at Steuben Street and Tioga Avenue in Corning to the H. K. Ferguson Company, engineers and contractors, Cleveland, O. The work will include a steel tank building, a steel and brick building to house drawing equipment and a boiler house. The property on which the new building will be erected was purchased some time ago and the erection of the building had been in mind for some time. President Hoover's request at the time of the stock market slump that business concerns proceed promptly to work out plans for new construction work in order to improve business conditions, is reported to have been taken into consideration when fixing the date for the new Corning building.

Fifty Years in the Bottle Industry

William J. Crane, vice president of the Owens-Illinois Glass Company on December 22, concluded fifty years of very active life in the bottle industry. During this period he has seen the making of glass change from the old open pot to the highly developed modern tank. He has seen hand workmen producing bottles by a method differing little from that the ancients practiced, to the very highly mechanized method of producing bottles today.

In all this period, Mr. Crane was not simply a spectator. but an active participant and took an active part in many of the outstanding incidents that have built this industry to the splendid proportions it now holds.

He started as an office boy in a glass factory at La Salle, Illinois on December 22, 1879. At a later date he became identified with the Streator Bottle and Glass Company, located at Streator, Illinois. This company enjoyed a conspicuous prominence in the production of beverage bottles and had a splendid and profitable career and was merged in 1905 into the American Bottle Company.

When the Streator Bottle and Glass Company was merged into the American Bottle Company, the abilities of Mr. Crane were drawn upon in large measure to bring about that merging and in the American Bottle Company he was the same potent factor that he had been in the previous organization.

When the American Bottle Company was acquired by the Owens Bottle Company his abilities were recognized, and later Mr. Crane took his place as president and general manager of the American Bottle Company Division of the Owens Bottle Company.

With the recent merger of the Owens Bottle Company and the Illinois Glass Company Mr. Crane became vice-president of the great new corporation.

Libbey-Owens Glass Company

At the annual meeting of the Libbey-Owens Glass Co., Toledo, O., C. O. Miniger of the Auto-Lite Company was elected to the board. The president's report to shareholders stated that the new continuous unit completed early in the fiscal year at East Toledo had been operated at full capacity and results from an operating standpoint had fully met expectations.

A new double line constituting the second and third continuous units together with the necessary buildings is now under construction, the first of which will be ready for operation early in 1930. The company, with the National Plate Glass Company and the Blue Ridge Glass Corporation which is owned jointly by the Corning Glass Works and the St. Gobain company of France, organized a company in July which purchased and controls the United States rights to the Bicheroux process of manufacturing blanks for the plate glass. This is particularly adapted to making thin plates.

The laminated glass plant showed a gain in production during each succeeding month of the fiscal year. During the year the company added an extensive proved acreage to its gas supply assuring an ample source of gas for many years to come. The president referred to the decrease in building construction during the year resulting in a smaller consumption of window glass which is below the previous year's requirements. Prices for window glass were approximately the same at the end of the fiscal year September 30, 1929 as those prevailing at the beginning of the fiscal year. The company's European licensee The Compagnie Internationale pour la Fabrication Mecanique du Verre and its subsidiaries in five different countries operated their plants at full production capacity during the year. The Belgian company is building a new three tank factory in the Commune de Houdeng-Goegnies.

The Japanese company continues to operate successfully. Canadian Libbey-Owens Sheet Glass Company plant which has not been in operation owing to a low Canadian tariff is still idle. The net earnings of the company for the fiscal year amounted to $3,515,652, net capital acquisition during the year covering stock investments, plant properties, etc., including permanent assets of the United States Sheet and Window Glass Company were approximately $6,500,000. Cash dividends amounting to $1,248,256 were paid during the year, $126,503 being the amount paid on the preferred, and $1,121,752 on the common.

Surveying Pennsylvania Ceramic Industries

Professor J. B. Shaw, head of the Department of Ceramics at Pennsylvania State College, sent out early in December to approximately 1,100 ceramic manufacturers a questionnaire designed to produce information from which a survey of the ceramic industries of Pennsylvania may be prepared. The purpose of the questionnaire is to obtain pertinent data relative to every producer of ceramic raw materials and manufactured products in the state. A description of each plant will be listed separately as well as tables compiled giving total values.

While the printed form which manufacturers are requested to fill in as completely as possible is designed primarily for the use of ceramic manufacturers using kilns, Prof. Shaw has advised THE GLASS INDUSTRY that it can be adapted to the use of glass manufacturers who can easily substitute "furnaces" for "kilns" and make other necessary changes. A supplementary sheet gives the list of products regarding which in-

formation is desired. Among the numerous items included in the list are the following: glass, glass bottles, glass tumblers, glass jars, etc., window glass, plate glass, tank blocks, glass pots, glass sand, feldspar, glasshouse supplies, tiles, etc. The recipient of the questionnaire forms are urged to give complete cooperation, filling it in and returning it promptly.

Glass Men to Report on Business Trends

The report of the advisory committee of 140 business representatives appointed by Julius H. Barnes, President of the United States Chamber of Commerce, in co-operation with President Hoover, to observe and report on changes in general business conditions throughout the country, which was requested for December 28 when the committee was organized a few weeks ago, had not been issued up to the time this issue went to press.

Representing the glass industry on the Committee are W. L. Clause, chairman of the Pittsburgh Plate Glass Company for the Plate Glass Manufacturers of America; James Morison of Toledo for the Glass Container Association; S. C. Gilmore, of Philadelphia, for the National Glass Distributors Association, and R. O. Woodruff of Atlanta for the American Bottlers of Carbonated Beverages.

November Building Construction

During the month of November, construction contracts were awarded to the extent of $391,012,500 in the 37 states east of the Rocky Mountains, according to F. W. Dodge Corporation. These states include about 91 per cent of the total construction volume of the country. The decline from the October total ($445,642,300) was a little more than $54,000,000, or 12 per cent. The decrease from the November 1928 total ($471,482,200) was about $80,000,000, or 17 per cent. The New York and Northern New Jersey District and the Northwest were the only two districts showing increases over the October 1929 and November 1928 records.

November Production of Polished Plate Glass

The production of polished plate glass for the month of November, 1929, was 12,130,845 sq. ft., as compared with 14,620,904 sq. ft. produced in the preceding month, October, 1929, and 11,646,064 sq. ft. produced in the corresponding month last year, November, 1928. These are the figures compiled by P. A. Hughes, secretary of the Plate Glass Manufacturers of America.

Trade Activities

The Brown Instrument Company, Philadelphia, Pa., has appointed E. B. Nichols as its chief engineer.

The Hemingray Glass Company, Muncie, Ind., is reported to have now three furnaces in operation with about 375 men employed.

Kankakee Glass Company, Kankakee, Ill., had a bad fire on December 15 resulting in the destruction of a stock of window glass estimated as worth more than $20,000.

The United States Glass Company, Pittsburgh, Pa., recently elected C. F. Neimann to the board of directors to fill the vacancy caused by the resignation of his uncle L. E. Meyran.

Morris Glass Company, Inc., Detroit, Mich., has been organized with a capital of $50,000 to manufacture and deal in glass products. L. L. Morris, G. B. Wright and Clara D. Campbell are the incorporators.

The Brockway Machine Bottle Company, Broadway, Pa., of which A. A. Macfadden is president is reported to be taking bids on new steel and corrugated iron buildings 90 x 160 feet, 50 x 100 feet and 60 x 150 feet, all one story in height.

William G. Watson who has been assistant superintendent of the Pittsburgh Plate Glass Company plant at Ford City, Pa. was recently appointed superintendent of the Kokomo, Ind. plant to succeed W. J. Golightly, who died recently.

The Victory Glass Company, Jeannette, Pa., has filed a complaint with the Public Service Commission, Harrisburg, Pa., against the Pennsylvania Railroad alleging an overcharge on shipments of glass sand to Jeannette from the Mapleton district.

The National Plate Glass Company, Ottawa, Illinois, subsidiary of the General Motors Corporation resumed operations on December 9 in their factory which was shut down a few weeks previously. Several hundred employes returned to work.

Alexander and D. C. Sloan, 535 Green Street, Cumberland, Md., are reported to have leased, with privilege of purchase, the Lonaconing glass plant formerly operated by the Utility Glass Company. Improvement of the plant is contemplated.

George T. Fulton, recently secretary and general manager of the Johnston Glass Company, Muncie, Ind., and his sons George L. Fulton and James P. O. Fulton resigned and are planning to establish a glass products manufacturing and sales business in that city.

Stiassny Glass Works, Vienna, Austria, according to a report printed in this country will build a new plate glass manufacturing plant at Burmoos near Salzburg. It was stated that a site has been acquired and the expenditure of $800,000 for plant and equipment will begin at once.

The Fostoria Glass Company, Moundsville, W. Va., announced early in December through President C. B. Roe that their old No. 3 plant which had been shut down for many years would be put back into operation about January 1. This will result in a large increase in the company's working staff.

The Dominion Glass Company, Ltd., according to a report from Montreal has elected Senator Donat Raymond a director to succeed T. B. Macauley, who retired from the board on which he had served since the organization of the company with the purpose of relieving himself of some of his onerous activities.

The Central States Flat Glass Company, Sandusky, O., was put into the hands of a receiver, E. J. Rosino of Krugers & Rosino, attorneys, by Judge W. L. Fiesinger on application of the Bankers Trust Company of Toledo, holders of a deed of trust of a bond issue of $60,000 of the local company. No manufacturing operations had been carried on during the past year.

The Harshaw Chemical Company, Cleveland, O., having outgrown their present business quarters have purchased a building for their own use on 97th Street just off Euclid Avenue. It is a four-story grey stone building, and will house the entire personnel of their Cleveland headquarters. The company is planning to extend its activities to other lines and fields in addition to those already covered.

The Millville Bottle Works Inc. has been organized to begin manufacturing operations in the old plant of the Millville Bottle Works, Millville, N. J. N. Bateman of Port Norris, N. J., is president, B. H. Loveless of New York is secretary. Walter Nicholson is treasurer, and David Blizzard, assistant treasurer. Hand blown glass jars and containers will be made, the melting being done in a pot furnace.

The Amtorg Trading Corporation, 261 Fifth Avenue, N. Y., announce that a permanent building exhibit is being organized in Moscow, U. S. S. R. in connection with a large program of factory, mill, housing and other construction now under way in the Soviet Union. All types and kinds of building, insulating, and roofing materials, etc., will be exhibited. Anyone interested in exhibiting materials may obtain full particulars at the above address.

The Pittsburgh Plate Glass Company has brought out a new shatter-proof glass "Duo-Lite" which it is said is superior to laminated window glasses so far produced. Duo-Lite is made of flat drawn sheet glass and Dupont pyralin. The flatness of the sheets drawn by the Pittsburgh Plate Glass Company's new equipment tends to eliminate waves and other irregularities, making the product very suitable for use as a window glass, though not adaptable for windshields or automobile windows.

The Corning Glass Works, Corning, N. Y., recently presented through former Ambassador Alanson B. Houghton, chairman of the board, the sum of $1,000 to each of four of the company's employes who had served from 50 to 55 years, in recognition of their long service. These men are George Miles, Wm. Rotsell, Fred Deuerlein, and F. J. Juttzman, Jr. Presentation of the checks was made at the company's annual banquet. The four employes have been with the company since the time their plant was located in Brooklyn, N. Y., from where it was moved to Corning 50 years ago.

The Owens-Illinois Glass Company, according to a report from Alton, Ill., which has been using about 400 tons of coal a day in its large bottle plant in that city has remodelled five furnaces and will hereafter heat them with natural gas brought from Louisiana. The pipe conveying the gas is 22 inches in diameter as far on the route as St Louis and a 14-inch tube is used from there to the plant at Alton. It is said that the gas is brought in under pressure of 50 pounds and between five and six million cubic feet of gas at 15 pounds pressure daily will be required after the plant is put on a natural gas basis exclusively.

Recent Deaths

Victor Gottfried Wicke

Victor Gottfried Wicke, president and general manager of the Imperial Glass Company, Bellaire, O., died at the age of 66 at his home in that city on December 10. Mr. Wicke had not been in good health for several years. His death was due to a cerebral hemorrhage. He had been president of the Imperial Glass Company since 1909 and for several years

VICTOR G. WICKE

previous to that had been connected with the glass manufacturing business. He was a man of notable business ability both in the manufacturing and marketing fields. At the time he took over the management of the Bellaire plant which had been forced to close due to lack of orders, Mr. Wicke began to build up the business and eventually made it a substantial success. Mr. Wicke was educated at the University of Berlin and spent several of his earlier years in business in Spain. Surviving him are his widow, Mrs. Meta Wicke, and two brothers, Bernhardt Wicke of Brooklyn, N. Y., and Walter, of Madrid, Spain.

The funeral services were attended by a large number of prominent glassmen from various parts of the country.

Ralph S. Binswanger

Ralph S. Binswanger of Richmond, Va., died on December 8 at the age of fifty. This was the third bereavement suffered by the family within a short period. On September 29, 1927, Ralph's brother Moses passed away and on July 25, 1929, another brother, Harry was taken. All were interested in the glass business of Binswanger & Company and were widely known and highly regarded throughout the trade.

James P. Noonan

James P. Noonan, vice-president of the American Federation of Labor and president of the International Brotherhood of Electrical Workers died at the age of 55 in Washington, D. C., on December 4 from the effects of burns received in a fire which broke out in his apartment.

W. D. Pollack

W. D. Pollack, superintendent of Macbeth-Evans Glass Company plant at Charleroi, Pa., for several years past died on December 5 at the age of 50.

Coming Meetings

The Feldspar Grinders' Institute, Inc., will hold a general conference at 10 A. M., January 14, 1930, in the East Building, Bureau of Standards, Washington, D. C., to consider the standardization of grades for the classification of feldspar on the basis of recommendations printed in full in this issue. All interested in feldspar are invited to attend.

The Feldspar Grinders' Institute, Inc., next regular meeting will be held on January 15 at Washington, D. C., the day following the special meeting at the Bureau of Standards on January 14.

The Glass Division of the American Ceramic Society will hold its annual meeting at Royal York Hotel, Toronto, Ontario, February 16 to 21, 1930. Details and program appear on page 9.

The Annual Pittsburgh Glass Show, the 50th of its kind, will be held in Pittsburgh, Pa., January 13 to 25.

What The World Wants

Specific Inquiries for American Goods Received in the Department of Commerce, Washington, D. C.

Canada—42580. Cheap glass vases and spools or pedestal.
New Zealand—42587. Soda-fountain glassware.
England—42708. Opal glass jars for toilet preparations.
Philippine Islands—42141. Novelty glassware.
Canada—42024. Glass battery jars.

Inquiries Received

For further information address THE GLASS INDUSTRY

481. Who makes Eureka glass fruit jars?
482. We would esteem it a favor if you can help us to find manufacturers of opalescent sheet glass.

READERS' WANTS AND OFFERS

FOR SALE
GAS & AIR VALVES

1—Forters Gas Valve, having 18″ opening for producer gas, flue openings 13″ x 20″.
3—24″ C. I. Air Valves.

HAZEL-ATLAS GLASS CO.
FACTORY NO. 2 WASHINGTON, PA.

For Sale: **CULLET** of all Descriptions
Free from Caps, Wires, etc.
GEORGE F. BAUMANN, Dealer,
1110 Carroll Street, Brooklyn, New York.
Carloads Ready for Immediate Shipment.

Current Prices of Glass-Making Materials, December 20, 1929

Quotations furnished by various producers, manufacturers and dealers.

		Carlots	Less Carlots
Acid			
Citric (dom.)	lb.	.46	.46
Hydrochloric (HCl) 20° tanks, per 100 lb.		..	1.10
Hydrofluoric (HF) 60% (lead carboy)	lb.	..	.13½
52% and 48%	lb.	.10	.10-.11½
Nitric (HNO_3) 38° carboy ext. Per 100 lb.		5.50	..
Sulphuric (H_2SO_4) 66° tank cars	ton	15.50	..
Tartaric	lb.	..	.38
Alcohol, denatured	gal.	..	.52
Aluminum hydrate ($Al(OH)_3$)	lb.	.04½-.05	.05½-.06
Aluminum oxide (Al_2O_3)	lb	..	.07
Ammonium bifluoride (NH_4) FHF	lb.	..	.21-.22
Ammonia water (NH_4OH) 26° drums	lb.	.03	.03¼
Antimony, metallic (Sb)	lb.	..	.09¾
Antimony oxide (Sb_2O_3)	lb.	..	.105-.11
Antimony sulphide (Sb_2S_3)	lb.	..	.14
Arsenic trioxide (As_2O_3) (dense white), 99%	lb.	.04	.05
Barium carbonate ($BaCO_3$)			
Precipitated	ton	57.50-59.50	60.00-61.50
Natural, powdered, imported	ton	45.00	50.00
Barium hydrate ($Ba(OH)_2$)	lb.	..	.05-.05½
Barium mixture, glassmaker's, f.o.b. St. Louis	ton	25.00	..
Barium nitrate ($Ba(NO_3)_2$)	lb.	.08¼	.08½
Barium selenite ($BaSeO_3$)	lb.	..	..
Barium sulphate, in bags	ton	..	..
Barium sulphate, glassmaker's, carlots, bulk, f.o.b. shipping point,	ton	15.00-16.00	18.00
Barium mixture, glassmaker's, f.o.b. St. Louis	ton	25.00	..
Bone ash	carlots, lb.	.06	.06½
Borax ($Na_2B_4O_7 10H_2O$)	lb.	..	.0355-.0425
Crystal	lb.	.028-.033	..
Granulated	lb.	.025-.03	..
Powdered	lb.	.02875-.03375	..
Boric acid (H_3BO_3)	lb.	.0625-.0712	.07-.0836
Refined	lb.	.0665-.0712	.08-.0836
Cadmium sulphide (CdS)—			
Red	lb.	..	1.20
Orange	lb.	..	1.00-1.25
Yellow	lb.	..	1.20-1.40
Chromium oxide (Cr_2O_3)	lb.	.24	.25
Cobalt oxide (Co_2O_3)			
In bbls.	lb.	..	2.10
In 10 lb. tins	lb.	..	2.20
Copper oxide			
Red (Cu_2O)	lb.	..	.30
Black (CuO)	lb.	..	.28-.30
Black prepared	lb.	..	.30
Cryolite (Na_3AlF_6) Natural Greenland Kryolith)	lb.	.09	.10-.10½
Artificial or Chemical	lb.	..	.09½
Epsom salts ($MgSO_4$) (imported) Per 100 lb.		..	1.15-1.20
Feldspar—			
100 mesh	ton	10.75-13.50	20.00 13.50-22.00
80 mesh	ton	11.00-11.75	14.50
40 mesh	ton	11.00	13.50
Fluorspar (CaF_2) domestic, ground, 95-98% (max SiO_2 2½%)			
Bulk, carloads, f.o.b. mines	ton	32.50	..
In bags or barrels	ton	36.50	41.50
Formaldehyde	lb.	..	.08¾-.09¾
Graphite (C)	lb.	..	.04-.07
Iron oxide—			
Red (Fe_2O_3)	lb.	..	.0450
Black (FeO)	lb.	.04½	..
Kaolin (f.o.b. mine)	ton	9.00	..
English, lump, f.o.b. New York	ton	14.50-25.00	24.50-30.00
Kryolith (see Cryolite)			
Lead chromate ($PbCrO_4$)	lb.	.875	.0975
Lead oxide (Pb_3O_4) (red lead)	lb.	.0775	.0875
Litharge (PbO)	lb.	..	..
Lime—			
Hydrated ($Ca(OH)_2$) (in paper sacks)	ton	6.50-9.50	..
Burnt (CaO) ground, in bulk	ton	7.00-8.00	..
Burnt, ground, in paper sacks	ton	9.00-11.00	..
Burnt, ground, in 280 lb. bbls.	Per bbl.	2.15-2.25	2.30-2.60
Limestone ($CaCO_3$)		2.00-2.50	..
Magnesia (MgO)—			
Calcined, heavy (in bbls.)	lb.	.06	.07
light (in bbls.)	lb.	..	.23
extra light (in bbls.)	lb.	..	.37
Magnesium carbonate ($MgCO_3$)	lb.	.06	.07
Manganese 85% (MnO_2)	lb.	.04	.04½
Nickel oxide (Ni_2O_3), black— for nickel content	lb.	..	.35
Nickel monoxide (NiO), green— for nickel content	lb.	..	.35
Plaster of Paris, bags	ton	21.00	23.00-29.00
Potassium bichromate ($K_2Cr_2O_7$)—			
Crystals	lb.	.09	.09¾
Ground	lb.	.11	.12
Potassium carbonate—			
Calcined (K_2CO_3) 96-98%	lb.	.06½	.07
Hydrated 80-85%	lb.	.05¾	.06
Potassium chromate (K_2CrO_4)	lb.	..	.23-.32
Potassium hydrate (KOH) (caustic potash)	lb.	.07⅛	.08
Potassium nitrate (KNO_3) (gran.)	lb.	..	.05¾-.06
Potassium permanganate ($KMnO_4$)	lb.	.16	.16½
Powdered blue	lb.	..	.24-.26
Rochelle salts, bbls.	lb.	..	.23
Rouge	lb.	..	..
Rutile (TiO_2) powdered, 95%	lb.	.15-.20	.20-.25
Salt cake, glassmakers (Na_2SO_4)	ton	22.00	..
Selenium (Se)	lb.	..	1.80-2.00
Silver nitrate ($AgNO_3$) (100 oz.)	per oz.	..	.34¾
Soda ash (Na_2CO_3) dense, 58%—			
Bulk, on contract	Flat per 100 lb.	1.22½	..
In barrels	Per 100 lb.	1.55-1.57½	1.80
In bags	Per 100 lb.	1.37½-1.40	1.62½
Spot orders	.025 per 100 lbs. higher		
Sodium bichromate ($Na_2Cr_2O_7$)	lb.	.07	.07½
Sodium hydrate (NaOH) (caustic soda) Solid	Per 100 lb.	2.95	..
Sodium nitrate ($NaNO_3$)—			
Refined (gran.) in bbls.	lb.	.03⅞	.04½
95 per cent	Per 100 lb.	2.16	2.30
Sodium selenite (Na_2SeO_3)	lb.	..	2.35
Sodium fluosilicate (Na_2SiF_6)	lb.	.05	.05½
Sodium uranate (Na_2UO_4) Yellow or Orange	lb.	..	1.50
Sulphur (S)—			
Flowers, in bbls.	Per 100 lb.	3.45	3.80-4.00
Flowers, in bags	Per 100 lb.	3.10	3.45-3.65
Flour, heavy in bbls.	Per 100 lb.	2.85	3.20-3.40
Tin chloride ($SnCl_2$) (crystals)	lb.	.39	.37½
Tin oxide (SnO_2) in bbls.	lb.	..	.42
Uranium oxide (UO_2) (black, 96% U_3O_8) 100 lb. lots	lb.	..	1.50-2.00
Zinc oxide (ZnO)	lb.	.08½	.12
American process, Bags	lb.	.06½	.07
Zircon			
Granular (Milled .005-.02c higher)		.07	.07¼-.08
Crude. Gran. (Milled .005-.02c higher)		.03½	.04-.05

Monthly Summary of United States Foreign Commerce in Glass

EXPORTS

Corrected to November 23, 1929

	October 1928 Quantity	October 1928 Value	October 1929 Quantity	October 1929 Value	Ten Months Ending October 1928 Quantity	Ten Months Ending October 1928 Value	Ten Months Ending October 1929 Quantity	Ten Months Ending October 1929 Value
Glass and glass products (Total)	.....	$992,316	.....	$1,019,163	.....	$8,323,210	.....	$9,204,406
Plate and window glass—								
Window glass, common, box 50 sq. ft.	1,616	8,546	1,247	7,558	13,223	80,977	14,630	85,659
Plate glass, unsilvered, sq. ft.	252,731	82,894	140,475	51,843	1,959,064	584,011	1,644,380	593,813
Other window and plate glass lbs.	440,860	65,019	530,776	43,653	2,777,320	327,980	3,916,742	413,027
Glass containers (bottles, vials and jars)	.....	312,439	.....	322,617	.....	2,984,652	.....	3,084,821
Table glassware, plain	.....	145,708	.....	150,802	.....	1,119,343	.....	1,249,898
Table and other glassware, cut or engraved	.....	11,350	.....	12,536	.....	119,661	.....	101,525
Lamp chimneys and lantern globes lbs.	82,752	19,532	128,892	25,886	1,402,850	284,698	1,400,497	282,000
Globes and shades for lighting fixtures lbs.	164,119	60,510	227,794	76,851	1,475,246	523,196	1,757,040	633,389
Chemical glassware lbs.	23,041	18,204	28,982	28,221	184,391	159,621	232,524	203,822
Electrical glassware, except for lighting lbs.	680,662	53,044	298,093	37,681	4,055,569	338,412	4,470,137	368,986
Other glassware	.....	215,070	.....	261,515	.....	1,800,659	.....	2,187,466

IMPORTS

Corrected to November 23, 1929

Glass and glass products	.....	1,583,207	.....	1,317,357	.....	12,860,377	.....	12,059,868
Cylinder, crown and sheet—								
Unpolished, not bent, obscured, beveled, etc.—								
Weighing less than 80 pounds per case dut. lb.	3,449,554	99,691	1,374,503	50,194	31,223,514	913,487	31,657,034	860,854
Weighing 80 pounds or over per case dut. lb.	2,547,672	102,593	2,613,628	94,550	26,529,427	1,183,471	29,485,789	1,100,103
Polished and bent, obscured, beveled, colored, etc., unpolished and polished, and all silvered dut.	.....	38,622	.....	48,619	.....	465,048	.....	481,620
Plate glass—								
Polished, unsilvered dut. sq. ft.	1,463,169	296,185	941,694	199,162	13,125,306	2,833,632	9,094,120	1,898,005
Other dut. sq. ft.	116,503	32,681	182,828	39,683	1,433,078	369,687	1,198,467	256,955
Bottles, vials, jars, demijohns and carboys, molded or pressed dut.	.....	29,265	.....	27,298	.....	206,563	.....	215,873
Table and kitchen utensils dut.	.....	31,154	.....	22,784	.....	234,634	.....	251,429
Glassware, cut or decorated dut.	.....	324,123	.....	356,711	.....	2,357,474	.....	2,775,420
Blown glassware, n. e. s.—								
Bottles, ornaments, gauge glasses and other n. e. s. dut.	.....	304,125	.....	184,882	.....	1,720,711	.....	1,579,466
Bulbs for electric lamps dut. No. 1	1,512,867	20,101	656,770	5,457	12,470,946	140,567	12,899,858	115,350
Chimneys, globes, shades, prisms and other illuminating glassware dut.	.....	118,930	.....	63,620	.....	797,003	.....	700,680
Articles and utensils for chemical, scientific, and experimental purposes dut.	.....	53,306	.....	68,052	.....	461,156	.....	557,488
Other glassware dut.	.....	132,431	.....	156,345	.....	1,176,944	.....	1,266,625